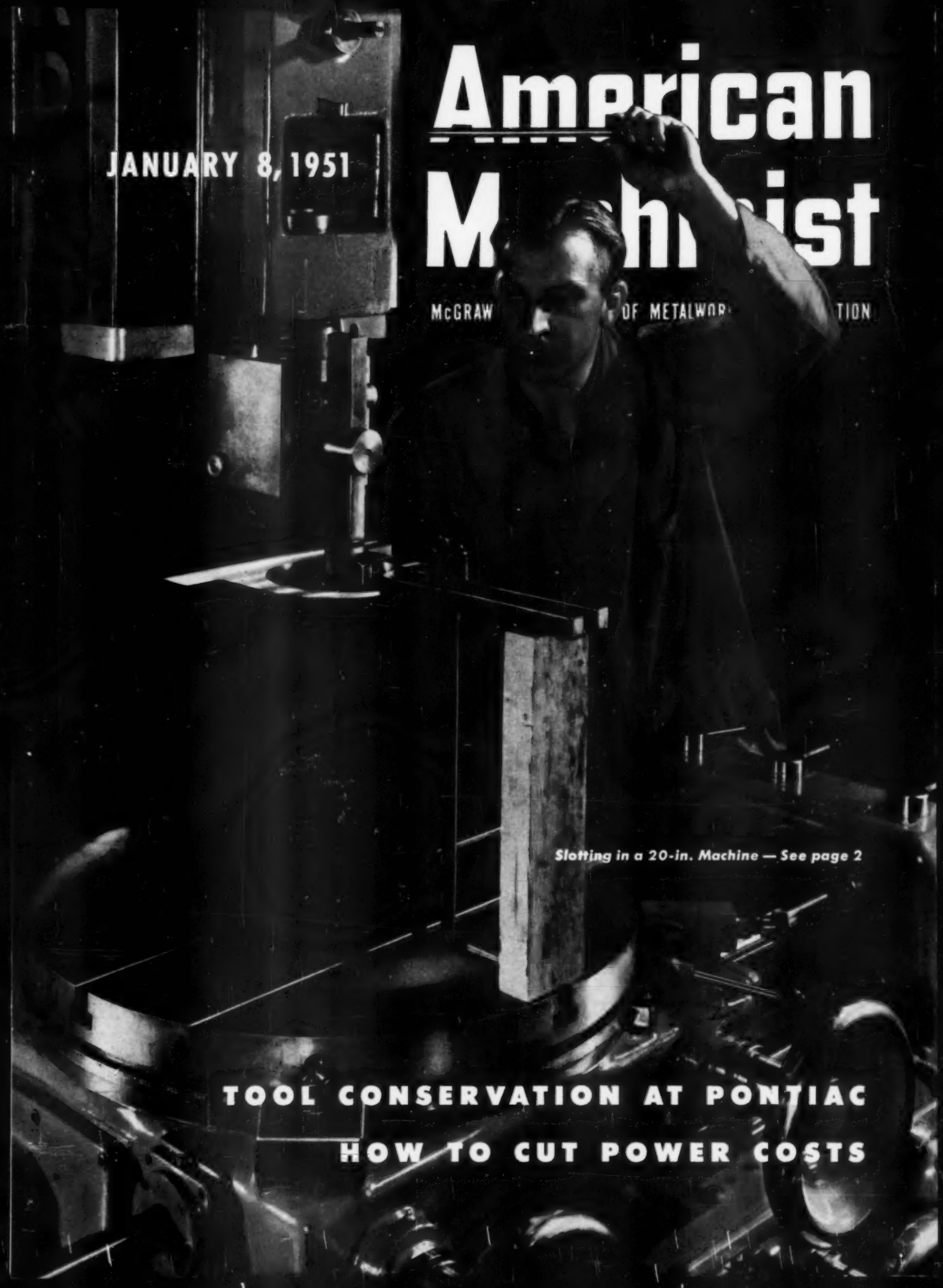
JANUARY 8, 1951

American Machinist

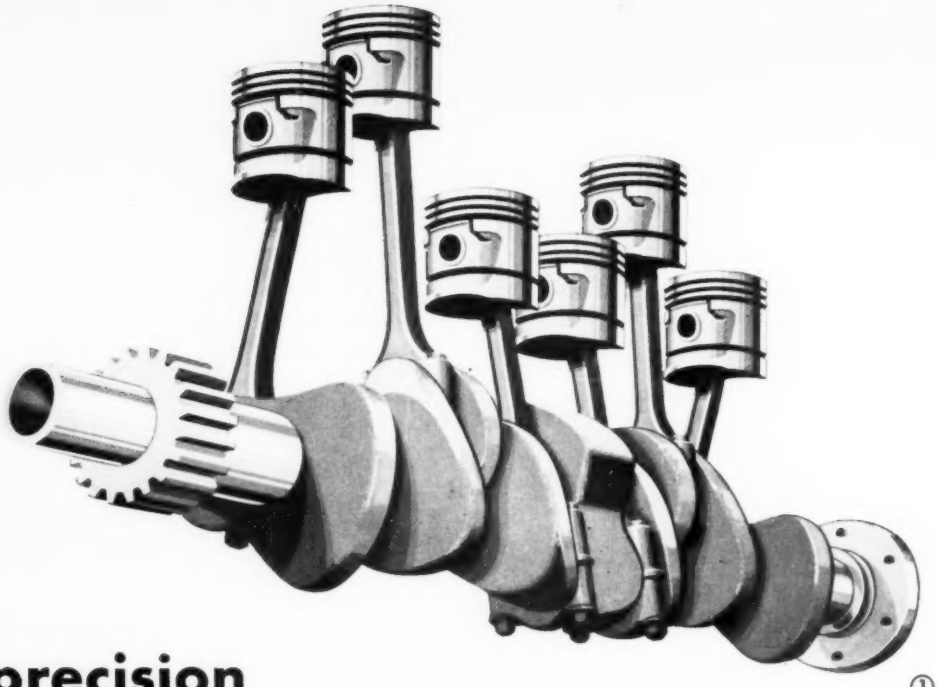
McGRAW [illegible] OF METALWOR[illegible] TION



Slotting in a 20-in. Machine — See page 2

TOOL CONSERVATION AT PONTIAC

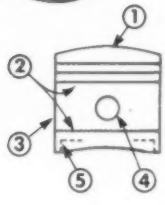
HOW TO CUT POWER COSTS



precision horsepower ...by Heald

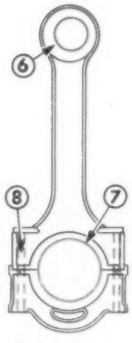
No—Heald doesn't *make* these piston and crankshaft assemblies. But Heald *machines* do! In fact the speed and precision of Heald grinders and Bore-Matics have long been important factors in the mass production of automotive parts. The nine Heald operations performed on the assembly shown above are typical examples.

Remember—when it comes to precision finishing, it pays to come to Heald.



Piston, conn rod and crankshaft components Precision finished on Heald Bore-Matics

1. Piston dome centered
2. Piston O.D. grooved for piston rings
3. Piston O.D. turned, straight or elliptical
4. Piston wrist pin holes bored and grooved
5. Piston skirt inside diameter bored
6. Wrist pin holes in conn rods bored, steel and/or bronze
7. Crankshaft holes in conn rods bored
8. Conn rod bolt holes bored
9. I.D. of crankshaft end bored



HEALD

THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

American Machinist

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Chips and QUIPS

Vertical Shaping . . . A 20-in.-stroke Rockford Hydraulic Slotter, Model SA, with the new fulcrum drive, at work on a component for the largest slotter ever built in the U. S. The machine being built will handle turbine and generator parts weighing up to 55 tons.

The photo, incidentally, is a Flexichrome—a new Eastman process by which a black-and-white print is dye-tinted to desired colors. It thus overcomes the common shop problem of non-photogenic colors and backgrounds.

Tool Savings . . . More than $100,000 was saved by Pontiac the first year of a new plan of tool control. Engineers study each job, determine what tools can be salvaged from other jobs for this one, or vice versa. Drills present an obvious example—drills worn too short for one job may be very suitable for another. There are dozens of other examples of using up tools with adapters or otherwise.

Blank Cutting Cheaper . . . H. J. Chamberland, research engineer at the DoAll Company, from the depths of his experience with contour saws, shows how contoured blanks, even in large lots, may be produced at bottom cost by band machining. He points out savings that are surprisingly large.

No Dust . . . North American Aviation, in making gyros for guided missiles, eventually installed a production setup in laboratory quarters, has operators wearing dust caps and aprons, lint-free cloth, all to stop the greatest enemy of an accurate gyro—dust.

Why Waste Watts? . . . Some months ago, Assistant Editor Bill Stocker went up to talk with five experts at G. E. From these interviews, he has put together a series of suggestions for saving real money on the electrical end of the plant. He's tried to give you what you need to know to suggest to your electrician or electrical staff what should be checked and what should be done.

Slotting . . . This issue seems to run toward slotting—with a cover on one job, and one article on a very different phase of it. Hanna Engrg. Works has screw heads to make in large quantities, so has developed pneumatic and hydraulic lmakups for the jobs that show real potential for other applications. Chester Kazek, Sr., chief tool engineer, describes the shop-designed rig for you.

New Heat Treat . . . E. F. Johnson and C. C. Miller of the Fort Wayne Works, International Harvester, collaborate to explain the steps they took to bring a heat-treating department up to date. There are some good ideas here on improving work flow and control.

Qualifying . . . Fairchild Engine, in common with many another shop, had serious scrap losses on involved, close-tolerance castings that failed to clean up when machined. The answer was found to be qualifying or targeting fixtures, some used right at the foundry. Eric Preece, works manager, describes their application, and the savings they can make. Initial machining is faster, individual layout is avoided, scrap is cut.

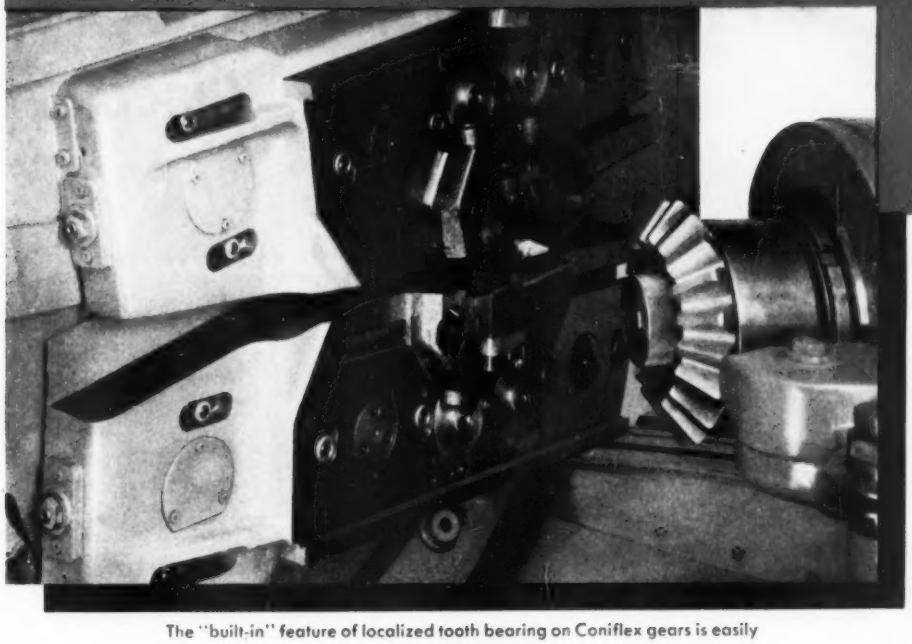
Air Drills . . . Some time ago, Keller Tool Co., developed the Airfeedrill, a drillpress driven by air that can be fastened to the job. Now, O. C. Tomlinson, works manager at Keller, describes several tricky jobs to which this self-contained unit has been applied.

Coming . . . Next issue of *American Machinist* is our eagerly sought-after Annual Review—the 38th, to be exact. We've changed the name this year, to look ahead rather than back. The new name: 1951 Production Preview. It will contain descriptions of more than 1500 items of new shop equipment, plus a statistical summary and look ahead, and several of our regular departments.

TOOL STEELER . . . R. W. Brown, specialist in tool steels and heat treating in the Materials Engineering section, East Pittsburgh Works, Westinghouse Electric Corporation, has had much to do recently with the choosing of proper mold steels for plastics. We therefore asked him to give you his experience in compact form. The result is our current article, describing two steels that Westinghouse finds suitable for almost all mold jobs. Their specs and characteristics are included.

Mr. Brown has a bachelor of science in metallurgy from Pennsylvania State College, so went directly to Bethlehem Steel Corporation upon graduation. After a period there as an apprentice, he went to Heintz Mfg. Co., manufacturer of stampings and assemblies in Philadelphia, and moved to Westinghouse in 1947.

CONIFLEX* GEARS HAVE LOCALIZED TOOTH BEARING



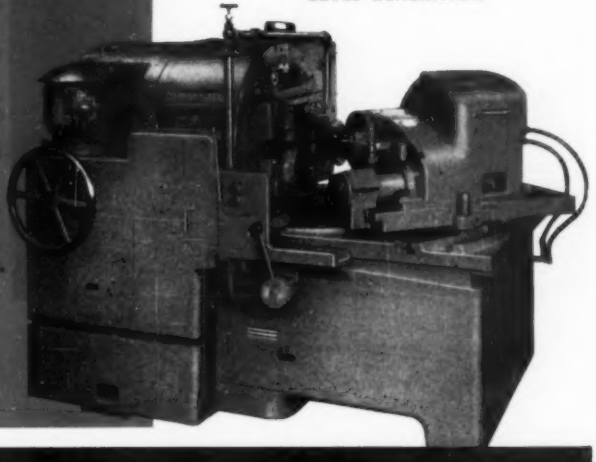
The "built-in" feature of localized tooth bearing on Coniflex gears is easily set through simple dial adjustments only on the face of the tool slides.

Coniflex gears are superior to ordinary straight bevels:

- in assembly, for they have wider tolerances for positioning.
- in operation, for they are built to provide even distribution of the load along the tooth surfaces without dangerous concentration at the ends of the teeth.

This "built-in" feature on the gear teeth can be obtained only on Coniflex gears cut on Gleason machines such as the Gleason No. 14 Straight Bevel Generator.

GLEASON No. 14 STRAIGHT BEVEL GENERATOR

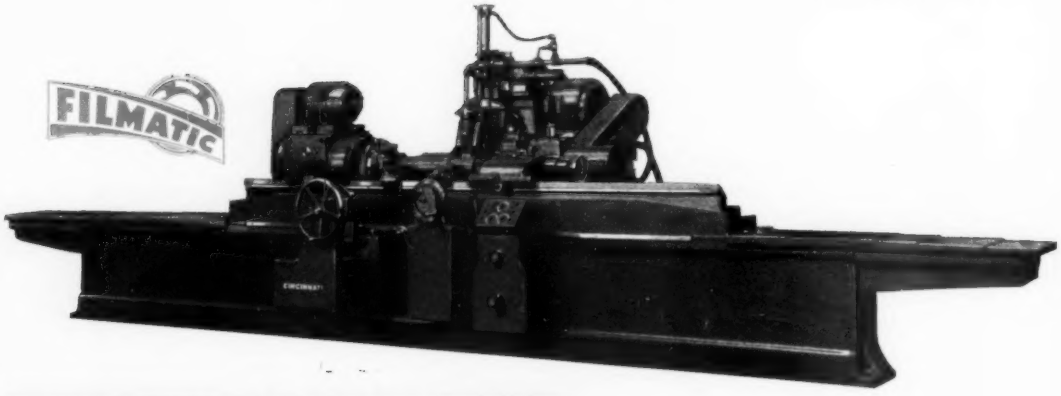


GLEASON Works
1000 University Avenue
Rochester 3, N. Y., U. S. A.

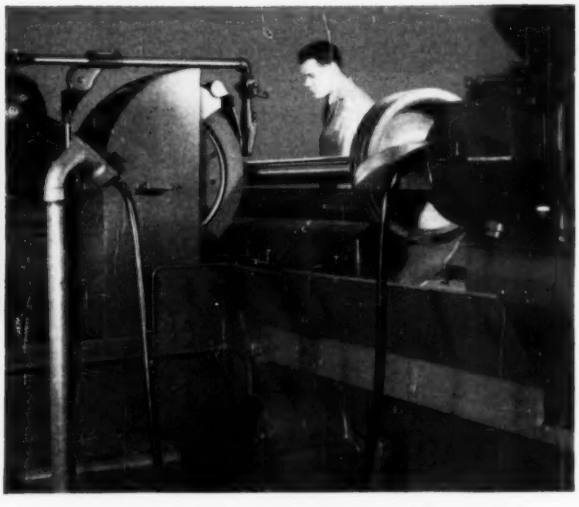
Builders of Bevel Gear Machinery for Over 85 Years

Shopping for Large

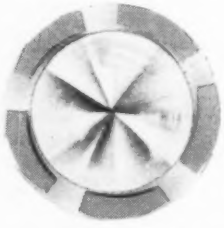
Cincinnati



CINCINNATI FILMATIC 16" x 96" Roll Grinding Machine, equipped with automatic wheel balancing and profile grinding wheel truing. Also available in plain and gap table styles. Catalog No. G-600.



CINCINNATI FILMATIC 16" x 120" Heavy Duty Grinding Machine showing gap table; for grinding locomotive piston rods, steel mill pinions, and similar parts.



FILMATIC bearings support the grinding wheel spindle on high pressure wedge-shaped oil films between each bearing segment and the spindle . . . no maintenance . . . no metal-to-metal contact.

CINCIN

Centertype Grinders?

offers . . .

AN INCREASED NUMBER OF SIZES

To better serve your precision grinding requirements, Cincinnati has added three sizes to its line of large centertype grinders: 16" Heavy Duty, 20" and 24" . . . in plain, gap, and roll grinder styles.

Cost reducing features of all sizes include:

FILMATIC grinding wheel spindle bearings—they eliminate bearing trouble; self-adjusting for every grinding condition; promote highest quality of finish.

Electronic control of table traverse—finger-tip selection of an infinite number of table traverse rates within 40 to 1 ratio.

Simple table drive—only a few parts from the motor to the table rack.

Pressure, filtered lubrication of ways.

Tilting wheelhead cambering unit—for the roll grinder style of these machines . . . double eccentric selection of infinite number of cambers.

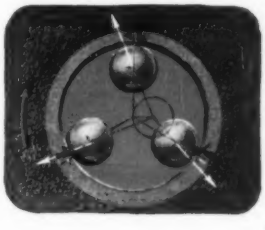
Automatic wheel balancing—this timesaving feature will quickly pay for itself.

These fine machines can be a cost reducing factor in your shop today and ten years from today. So choose CINCINNATI FILMATICS to give your precision ground work an extra measure of quality at a lower cost. Write for literature, or consult Sweet's Mechanical Catalog for brief specifications.

CINCINNATI GRINDERS INCORPORATED

CINCINNATI 9, OHIO

Electronic selection of table traverse rates is just as easy as turning a radio dial. Control knob is conveniently located near operator's right hand. Power taken from an AC source.



Automatic wheel balancing quickly pays for its extra cost because grinding wheels can be perfectly balanced on the machine in a few seconds.

NATI

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

Precision Gear Cutting by

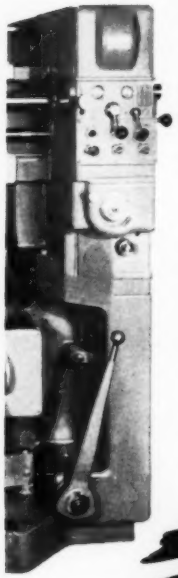
NO. 10 ROTARY GEAR SHAPER
for high-production of spur and helical, external and internal gears.
THE NO. 36 GEAR SHAPER for large diameter wide face spur, spur and helical, external and internal
THE NO. 20 GEAR SHAPER for general purpose gear cutting up to 36 inches P. D., external and internal, spur and helical — also cams and other contours.

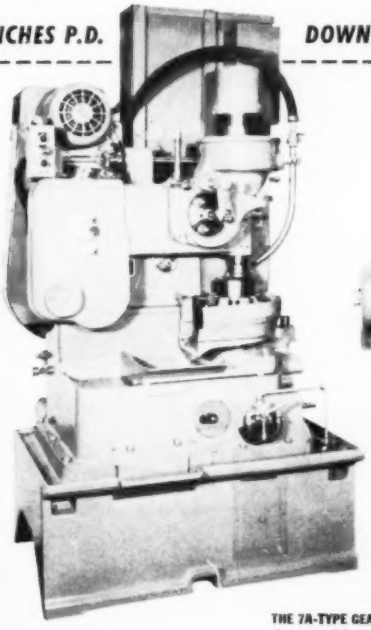
THERE'S A FELLOWS GEAR SHAPER FOR ALL GEAR CUTTING REQUIREMENTS, RANGING

the FELLOWS METHOD

Recent developments in Fellows equipment for producing gears include many factors that assure increased high-quality production including: heavier feeds, higher cutter reciprocating speeds, and automatic or semi-automatic functions. Cutting time is less than ever before, and loading and unloading is greatly simplified. Each gear cutting machine is a generating tool, and utilizes the basic generating principle first applied by E. R. Fellows in his pioneer invention of the Gear Shaper. Complementary production equipment includes gear shaving and complete inspection equipment.

FROM 100 INCHES P.D. ***DOWN TO 1/16-INCH PINIONS***

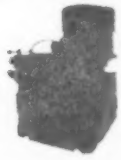




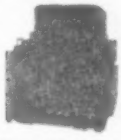
THE 3-INCH FINE-PITCH GEAR SHAPER for fine-pitch gears up to 3 inches P.D. Magazine loading and de-burring attachment optional.

THE 7A-TYPE GEAR SHAPER—here shown with special arrangements for the high-speed production of internal helical gears.

THE FELLOWS COMPLETE LINE INCLUDES SHAVING MACHINES



NO. 8 FULL-TOOL SHAVING MACHINE for high production on external gears, spur or helical.



NO. 11 SHAVING MACHINE for internal spur and helical gears.

AND THESE INSPECTION INSTRUMENTS

THE "RED LINER" for charted all-error inspection of external or internal gears.

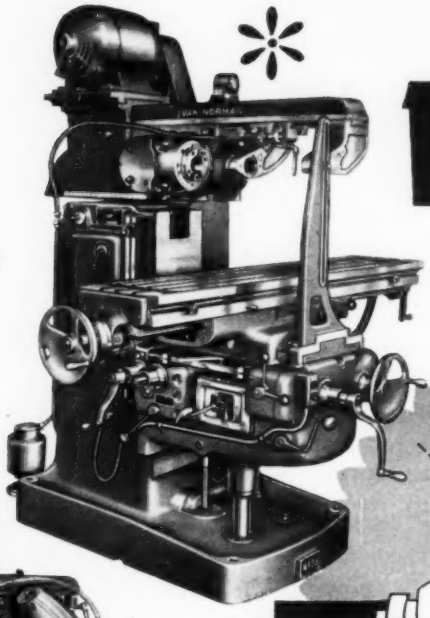
INVOLUTE INSPECTION INSTRUMENTS for charted records of tooth profiles.

LEAD INSPECTION INSTRUMENT which measures and records the lead of helical teeth.

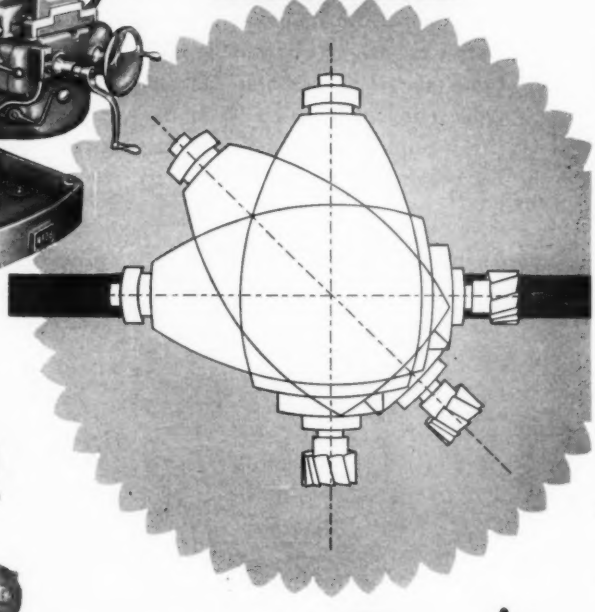
Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Dept., 78 River St., Springfield, Vt., U.S.A.
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 2206 Empire State Bldg., N. Y. 1.

VAN RAM

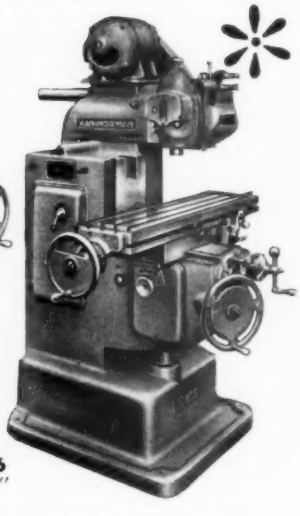


MODEL NO. 38
Table: 64″ x 14″



MODEL NO. 26
Table: 58″ x 13″

MODEL NO. 22L
Table: 45″ x 10″



MODEL NO. 16
Table: 37″ x 9½″

NORMAN TYPE MILLERS

Give You Every Advantage For Increasing Machine and Operator Output

ADJUSTABLE CUTTERHEAD ELIMINATES IDLE MACHINE TIME — CUTS MILLING COSTS!

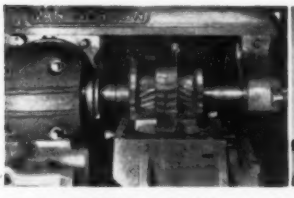
Van Norman Ram Type Millers give you every advantage for reducing milling costs

The adjustable cutterhead, which permits vertical, horizontal or angular milling on one machine, cuts idle machine time by as much as 50%. The moveable ram plus the saddle cross feed increases the work range and capacity of the miller . . . enables you to handle larger work pieces with ease. There is no waiting for single purpose machines because practically all milling operations can be accomplished on *one* Van Norman Ram Type Miller.

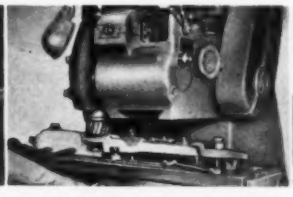
Van Norman Ram Type Millers are simple to operate. Controls are conveniently grouped for ease of accessibility. Hardened and ground steel fixed cutterhead stops permit true settings at horizontal or vertical positions. The rugged construction throughout assures accuracy and long life.

Investigate Van Norman Ram Type Milling Machines for toolroom, laboratory, pattern and die work, job shop or production milling. Available with plain or universal saddles in a wide range of sizes.

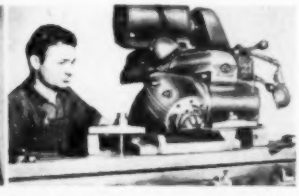
Here's How Van Norman Ram Type Millers Increase Production



Horizontal Milling — Simply lock head in horizontal position and you're ready for horizontal milling. Ram-type overarm and outer support assures rigidity and accuracy.



Vertical Milling — With the cutterhead in vertical position, the operator is ready to perform conventional vertical milling. Hardened stop set at the factory assures positive 90° setting.



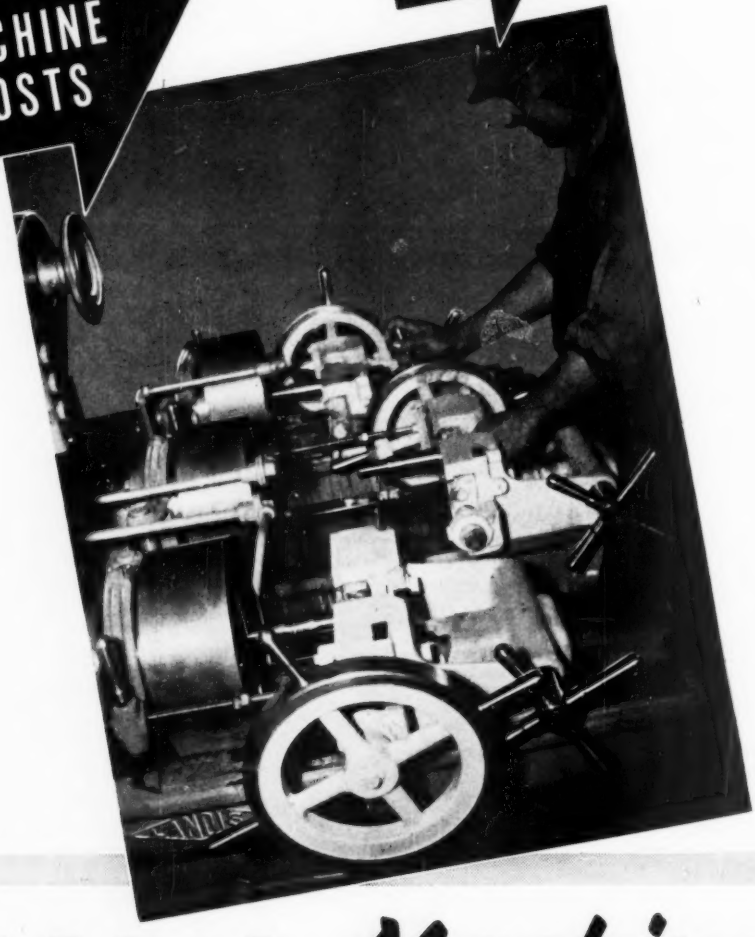
Angular Milling — Lock the cutterhead in any desired angular position and you're ready for angular milling with standard cutters. Graduated dial in degrees makes positioning easy.

VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS

Railroad Cuts Standby

SAVINGS IN MACHINE COSTS

SAVINGS IN LABOR

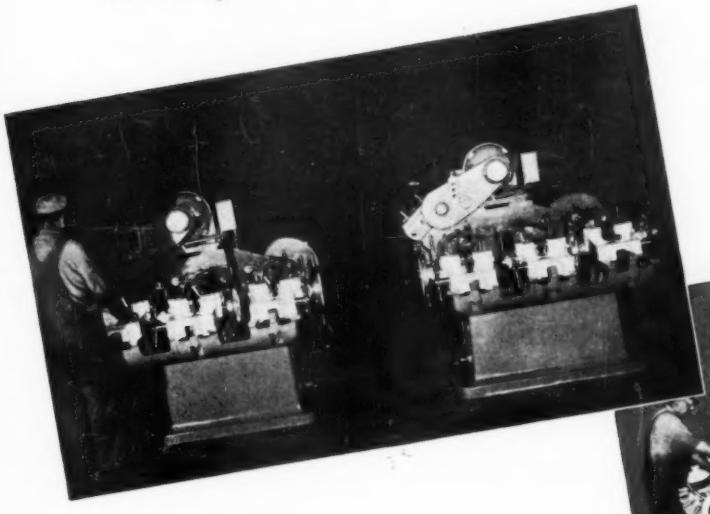


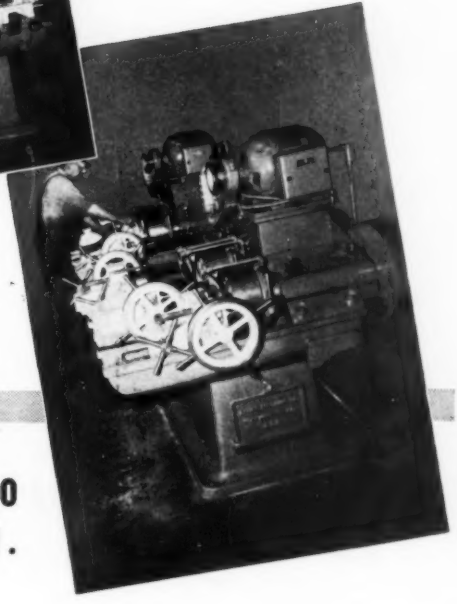
The LANDIS Machine

Maintenance Costs . . .

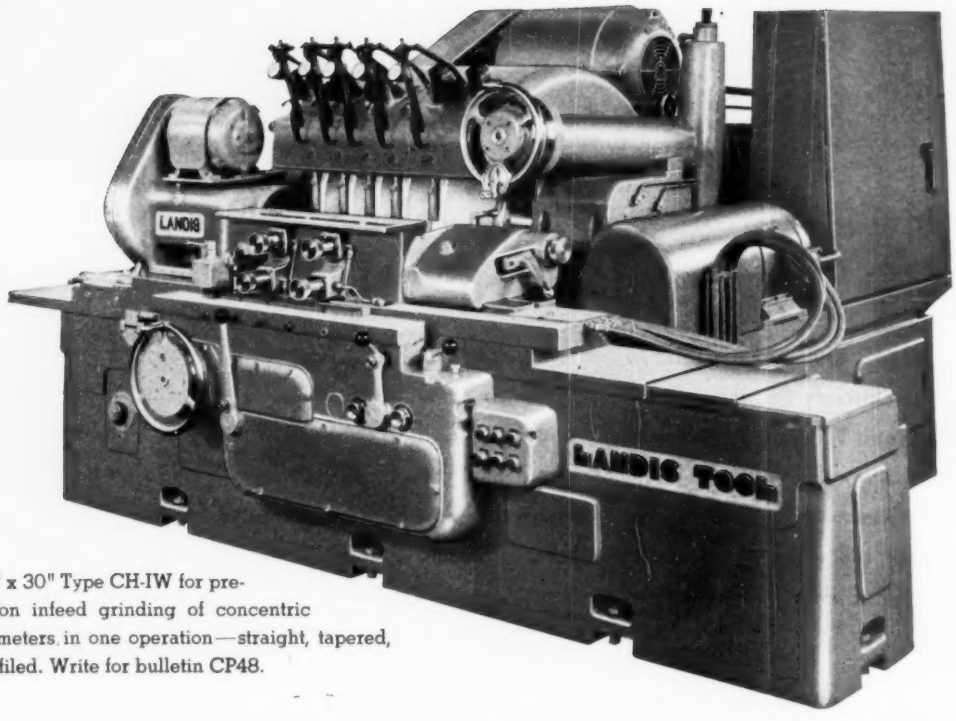
Large savings in capital invested in heavy machinery and hourly labor costs have been effected in the maintenance shops of the Chicago, Burlington, and Quincy Railroad. In the past, four machines, each with an operator, were used exclusively for threading 1¼" steam engine bolts. Recently two Landis 1½" Triple Head Threading Machines were installed in these shops. These Landis Machines now do the work previously done by the four machines of another type. Two men now operate these machines where four men were previously required. Such savings are one reason for the widespread use of Landis Threading Equipment in railroad shops throughout the country.

For further information and specifications, write for Bulletin B-55.





CO. WAYNESBORO PENNA. U.S.A.



10" x 30" Type CH-IW for precision infeed grinding of concentric diameters in one operation—straight, tapered, profiled. Write for bulletin CP48.

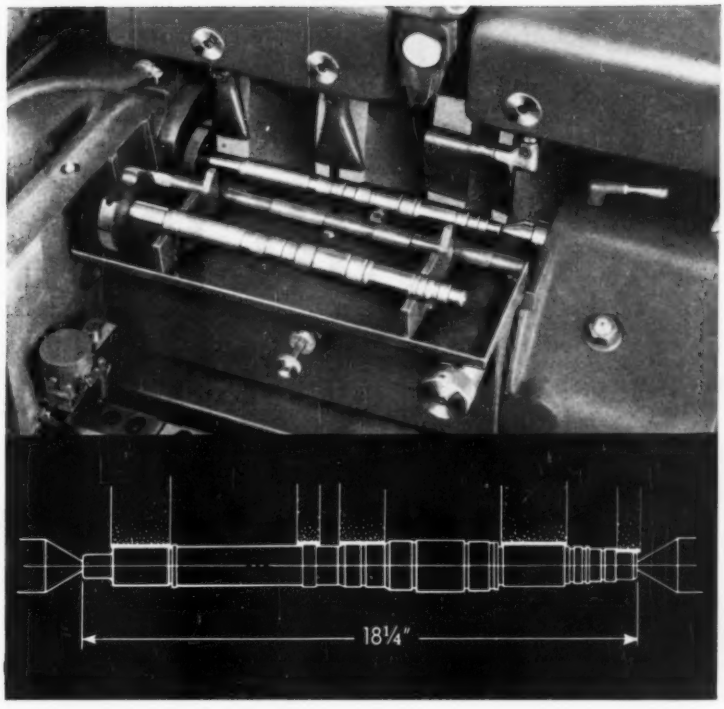
Multiple Wheel Grinder

LANDIS TOOL
Precision Grinders
124

If you submit blueprints of your work pieces, our engineers will make production estimates and tooling suggestions without obligation.

EQUIPPED WITH MICROSPHERE BEARINGS

Grinding 5 diameters in one operation.



Reduces Precision Grinding Costs

by eliminating extra grinding operations

How you can save!

LESS **INVESTMENT** One IW replaces two or more conventional cylindrical types.

LESS **MAN HOURS** Any number of different concentric diameters ground in one operation with semi-automatic cycle.

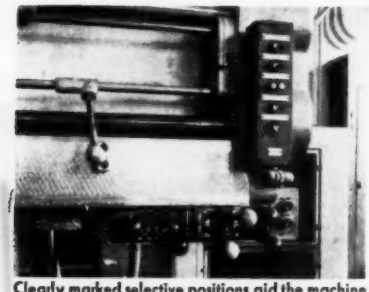
LESS **SETUP TIME** A single setup on the IW instead of two or more setups on the machines which the IW replaces.

LESS **WORK HANDLING** Only one loading and unloading operation. No moving work from one machine to another.

LANDIS TOOL COMPANY WAYNESBORO, PENNA., U.S.A.

6 profitable machining advantages with this

new CINCINNATI HYPRO Vertical Boring Turning Mill*



Clearly marked selective positions aid the machine operator. Sixteen feeds are provided from .004" to .750" Ram and saddle movement completely independent. Any combination of up, down, in, or out feed travel possible. Controls convenient to operator supplied as unit for each head.

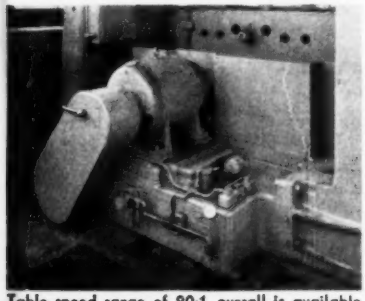


Table speed range of 20:1 overall is available with 3:1 or 6:1 adjustable voltage drives. Through a motor-generator arrangement, infinitely variable speeds are obtainable within this range.

*Patents applied for.

● A series of important design improvements offers many machining advantages in this *new* 12-ft. Cincinnati Hypro Vertical Boring and Turning Mill. Closer control and greater convenience increase its flexibility in handling a wide variety of standard and special work. Here is how these profitable advantages are obtained:

With the machine's new pendant control electro-hydraulic shift, the operator has full control of feeds and speeds and rail and side heads at those points most convenient to the cutting tool. No time is wasted walking to the shift lever, formerly located at the front or side of the machine table.

The accessible pendant station reduces operator fatigue by simplifying on-the-spot functions. This finger-tip control enables the operator to watch the work more closely and with greater safety.

Independent Rail and Side Head Drives

Important in this newly designed machine are the rail and side heads having separate traverse motors. In addition to immediate and positive power, the advantages of independent motors to operate the heads mean fewer vital parts to wear, and maintenance is sharply reduced. Greater flexibility of control also results.

50 H.P. Adjustable Voltage Drive

Table speed range of 20:1 overall is available with 3:1 or 6:1 adjustable voltage drives. Infinite speeds may be selected within this range. Control functions handled through the pendant station include remote shifting of the single shift for the two table speed ranges. The pendant energizes a solenoid. This in turn activates the single shift mechanism hydraulically. Clutch and gear train respond to this hydraulic circuit arrangement.

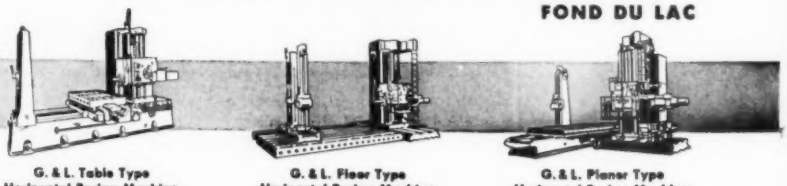
A new feed box provides 16 feeds between .004" and .750". Flame hardened gears are used and are mounted on anti-friction bearings. Easy access to the gear box simplifies changeover for special functions such as taper turning, thread cutting and drum scoring.

Three circular non-metallic bed ways are used between the bed and table surfaces. Force feed lubrication is provided for the large, central roller bearing that takes the table thrust, in addition to forced lubrication to the three table tracks taking vertical loads.

Combined features of this new Hypro machine may solve your machining problems easier, faster and more profitably. Ask experienced Hypro engineers for recommendations.

GIDDINGS & LEWIS
FOND DU LAC

G&L HYPRO



G. & L. Table Type Horizontal Boring Machine

G. & L. Floor Type Horizontal Boring Machine

G. & L. Planer Type Horizontal Boring Machine

Two heads cut simultaneously to remove metal faster on this casting. Note helical rack on each ram—designed for smoother operation. Finger-tip machine control is instantly available through the pendant station shown.

NEW CINCINNATI HYPRO FEATURES

1 **Pendant Control Electro-Hydraulic Shift** — improves overall operating convenience.

2 **Finger-Tip Feed and Speed Control**—accessible pendant station enables operator to watch work more closely.

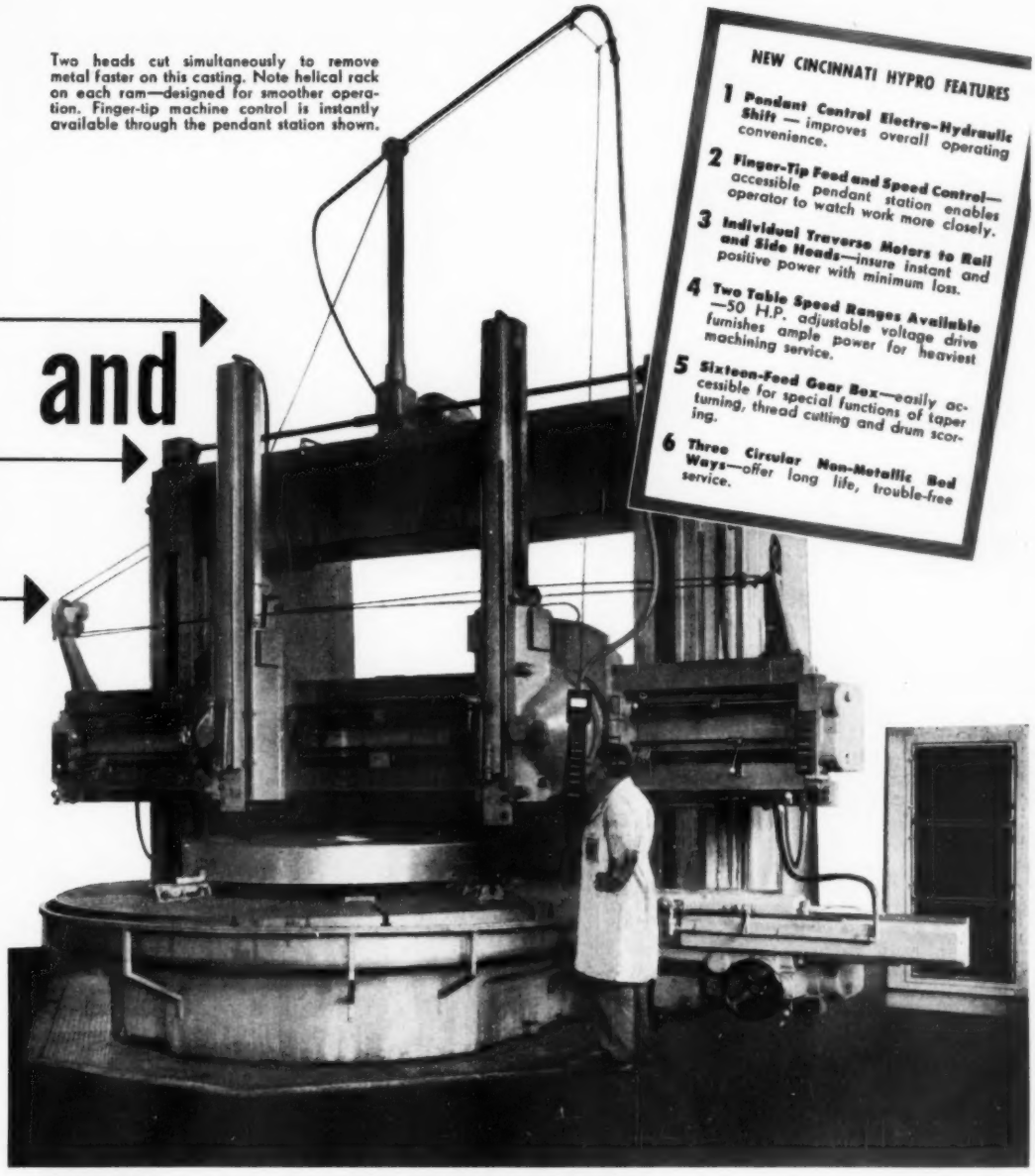
3 **Individual Traverse Motors to Rail and Side Heads**—insure instant and positive power with minimum loss.

4 **Two Table Speed Ranges Available**—50 H.P. adjustable voltage drive furnishes ample power for heaviest machining service.

5 **Sixteen-Feed Gear Box**—easily accessible for special functions of taper turning, thread cutting and drum scoring.

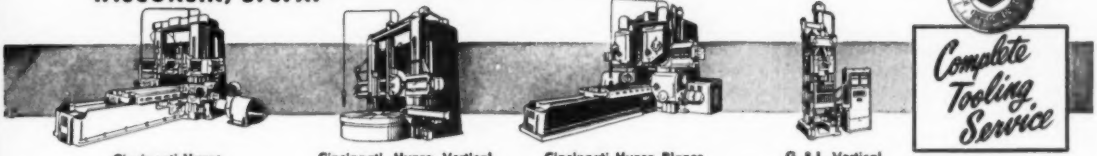
6 **Three Circular Non-Metallic Bed Ways**—offer long life, trouble-free service.

and



MACHINE TOOL COMPANY

WISCONSIN, U. S. A.



Cincinnati Hypro Double Housing Planer

Cincinnati Hypro Vertical Boring and Turning Mill

Cincinnati Hypro Planer Type Milling Machine

G. & L. Vertical Plastics Injection Press

DAVIS

Complete Tooling Service

Now...Walker-Turner **design** helps you make sharper cuts in production costs!

New 16" Band Saw...

Seldom are the cost-cutting advantages of Walker-Turner design so *clear-cut* as in this new 16" metalworking band saw. Take, for example, its three-piece frame and body construction. The greater rigidity and accuracy, the smoother operation this affords, means more production per operator and longer machine life.

But where the efficiency of this production machine really shows up is in operating savings. A patented Automatic Feeding Mechanism for straight or irregular cutting positively prevents overloading the blade . . . greatly prolongs blade life.

Here, in short, is a metal-cutting machine designed for profitable operations. Put the new Walker-Turner 16" Band Saw to work in your shop, and watch how it speeds cutting and cuts production costs. Catalog describes fully this and other machines in Walker-Turner's complete line of power tools for metal and woodworking operations. Mail coupon for your copy.

SOLD ONLY THROUGH AUTHORIZED DEALERS

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Please send me the new Walker-Turner Machine Catalog.
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GARDNER abrasive discs

4 ways to improve operation of any disc grinder

FAST, COOL CUTTING
Corrugated for large area work or thin parts. Three sizes of corrugations available.
FULL VALUE
Long cutting life with all of rated thickness of usable abrasive.
EXTRA SAFETY
Heavy steel wire mesh WIRE-LOKT construction guarantees complete safety.
FINE FINISHES
Smooth face where character of finish is of prime importance and stock removal is light.
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100A

GARDNER WIRE-LOKT ABRASIVE DISCS

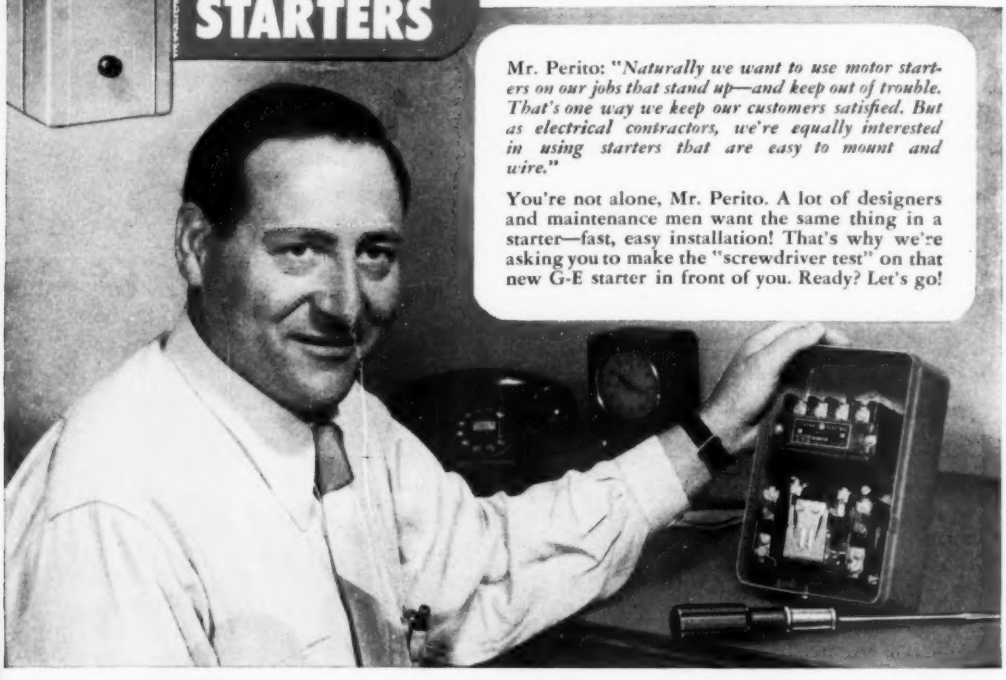
full range of types and sizes.

GARDNER MACHINE COMPANY

410 East Gardner Street • Beloit, Wisconsin, U.S.A.

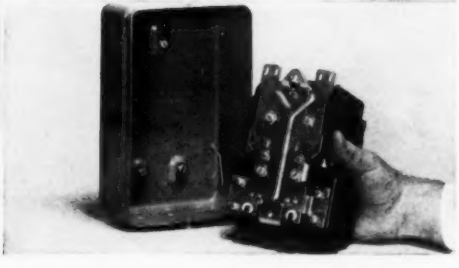
MOTOR STARTERS ...easier to

T.G. PERITO, ELECTRICAL CONTRACTOR, LEARNS



Mr. Perito: "*Naturally we want to use motor starters on our jobs that stand up—and keep out of trouble. That's one way we keep our customers satisfied. But as electrical contractors, we're equally interested in using starters that are easy to mount and wire.*"

You're not alone, Mr. Perito. A lot of designers and maintenance men want the same thing in a starter—fast, easy installation! That's why we're asking you to make the "screwdriver test" on that new G-E starter in front of you. Ready? Let's go!



1 Mr. Perito: "*How is this contactor mounted in the case?*"
By means of keyhole slots you see in the contactor base, Mr. Perito. After you've mounted the empty case on the wall or a machine, you locate the keyhole slots over the mounting screws and the contactor slips into place!

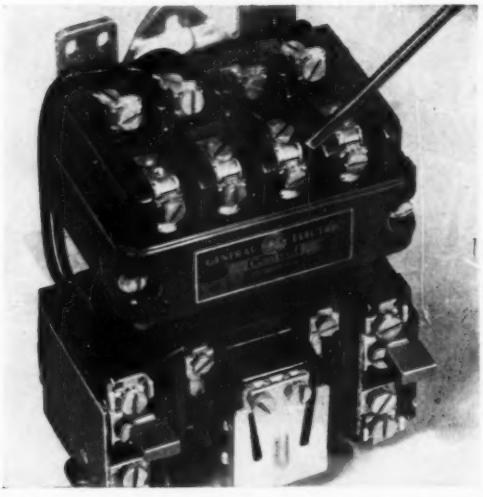
2 Mr. Perito: "*Lots of knockouts, I see!*"
You'll find these on every side of the case—more than enough to give you faster, neater installations. Plenty of room on the inside, too, and notice how the light grey finish on the inside gives you plenty of reflected light!

GENERAL ELECTRIC

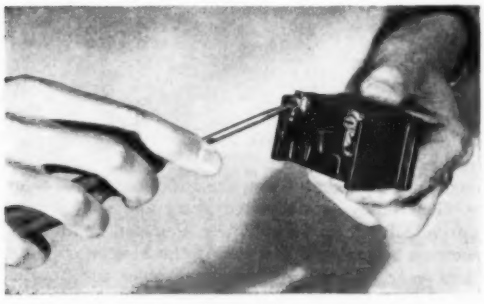
730-18

install for these 6 reasons

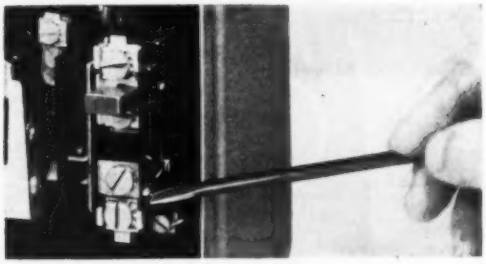
ABOUT THESE IMPORTANT FEATURES WITH THE "SCREWDRIVER TEST"



3 Mr. Perito: "*Are all the terminals easy to get at?*" Every one of them is *up front* where it's easy to get at, and wire. And they're *big* terminals with panhead screws and saddle-type connectors that ride up with the screw head. The stripped wire simply slides into place and is easily secured with a turn of your screwdriver.



4 Mr. Perito: "*Tough-looking coil! Is it new?*" Right! It's called the "Strongbox Magnet Coil" and it's an exclusive with the new G-E starter line. Feel how solid it is! If your electrician's screwdriver slips, it can't hurt the windings—they're safely locked in a block of molded plastic. And oil, dust or water can't get at them, either!



5 Mr. Perito: "*How do I set the overloads?*" Easy—and you don't have to take the starter apart to do it. Flip that little lever and it's on "Automatic." Flip it back and it's on "Manual." Heaters are in the front, can be changed without disturbing any wiring.

6 Mr. Perito: "*What about maintenance?*" Once this new G-E starter is installed, it *stays* installed. There's no need to remove the case for ordinary maintenance or even to replace or reverse contacts. Just remove the arc chute and there are your terminals.

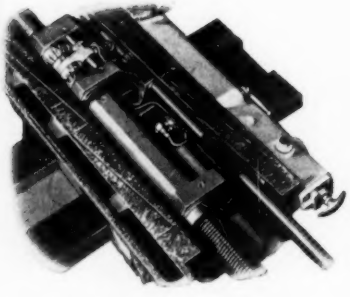
WHY DON'T *YOU* "BUY ONE AND COMPARE?"

See for yourself why this new line of G-E motor starters lasts longer, costs less to install than almost any other starter you can buy. Your G-E representative or authorized G-E agent or distributor can supply you from stock in NEMA sizes 0, 1, 2 and 3 for a-c motors up to 50 hp. For a complete description, write for Bulletin GEA-5153. *Section 730-18, Apparatus Dept., General Electric Company, Schenectady 5, New York.*

GREATER MACHINE LIFE

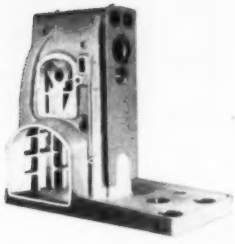
A new line of Knee-Type Milling Machines

KEARNEY & TRECKER MILWAUKEE **CK's**

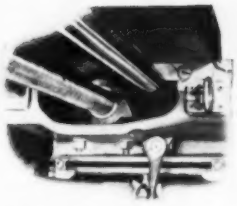


Part by part — unit by unit — Kearney & Trecker's new CK milling machines are built to give you the maximum in *Greater Machine Life*. Generously proportioned gears and shafts, plus automatic, positive lubrication easily meet overload conditions. Every component is engineered to provide the kind of rigidity and resistance to wear that the greater horsepower and heavier cutting loads of modern milling methods require. For fullest protection, column and knee are forced flood lubricated. A positive, metered, pressure system takes care of table, saddle and knee ways and table feed assembly. Add Greater Machine Life to all the other great new CK features and you'll see why these new CK's are the most productive, most profitable milling machines you can buy today — anywhere!

Replacement of obsolete machine tools is an



GREATER RIGIDITY — Yes, these new CK columns are the most rigid milling machine columns we've ever designed! They give you 1000 pounds more metal scientifically distributed in heavier ribbing, box section, sponson construction . . . to effectively absorb vibration from heaviest cutting loads.

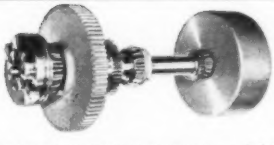


SMOOTHER FEED PERFORMANCE — with a new design 2" diam. heavy-duty, table feed screw that affords greater bearing contact and runs through an extra-long table feed nut. These new CK machines are equipped with a backlash eliminator for more effective climb milling, more accuracy and longer screw life.

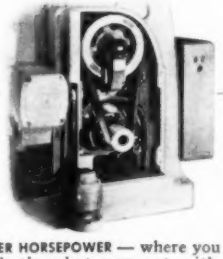
GREATER ADAPTABILITY — No. 60 Heavy Duty drive flange on Nos. 4, 5 and 6 machines enables use of heavy duty arbors with flange drive for large single or multiple cutter setups; or bolting large face-milling cutters directly to spindle nose. Average setups use standard arbors with No. 50 spindle drive.

NON-GLARE RAPID-SET DIALS—You'll avoid costly errors in reading and setting these new micrometer dials. They're vapor blasted to give you a satin surface with high contrast markings. They're easy and quick to set and provide positive lock at every setting.

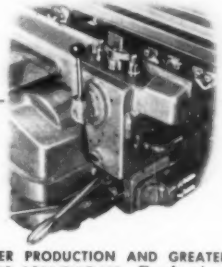
FEEDS AND SPEEDS TO TAKE FULL ADVANTAGE OF MODERN CUTTING TOOLS — and you really can do it with the broad feed and speed ranges on Kearney & Trecker's new CK milling machines. You get 24 spindle speeds (15 to 1500 rpm on Nos. 2 and 3, 13 to 1300 rpm on Nos. 4, 5 and 6) with Kearney & Trecker's automatic protecto-mesh shift to eliminate gear clashing. And there's the extra-wide feed range — 32 changes from $\frac{1}{16}$" to 90" per minute—with separate 3 or 5 hp feed and rapid traverse drive.



GREATER CUTTING EFFICIENCY — Added momentum of spindle-mounted flywheel assures longer cutter life and greater efficiency, through smoother, more positive drive — a key to most efficient use of modern cutting tools. Spindle rigidly supported by Kearney-& Trecker's original 3-bearing design.



GREATER HORSEPOWER — where you need it. That's what you get with new CK independent motor drives for spindle and for feed and rapid traverse. Depending on machine size (Nos. 2, 3, 4, 5 or 6), machines range from 10 to 25 hp for spindle drive and 3 to 5 hp for feed and rapid traverse.



GREATER PRODUCTION AND GREATER OPERATING CONVENIENCE—Production men will like Mono-Lever Control because it reduces idle cutter time, shortens floor-to-floor cycle time on both long and short run lots. Operators will like it because it makes faster, simpler, less fatiguing work for them.

Kearney & Trecker's new CK line of knee-type machines is designed to meet every demand of present-day milling . . . making them more accurate, and MORE PRODUCTIVE for you. Contact your Kearney & Trecker representative or write direct to obtain their complete specifications. Find out how CK machines easily replace obsolete machines at substantial savings to you. Kearney & Trecker Corp., 6784 N. National Ave., Milwaukee 14, Wis.

KEARNEY & TRECKER
MILWAUKEE
MACHINE TOOLS

investment that makes Dollars and Sense.

REPLACEMENT DELIVERS 49%* TIME SAVINGS

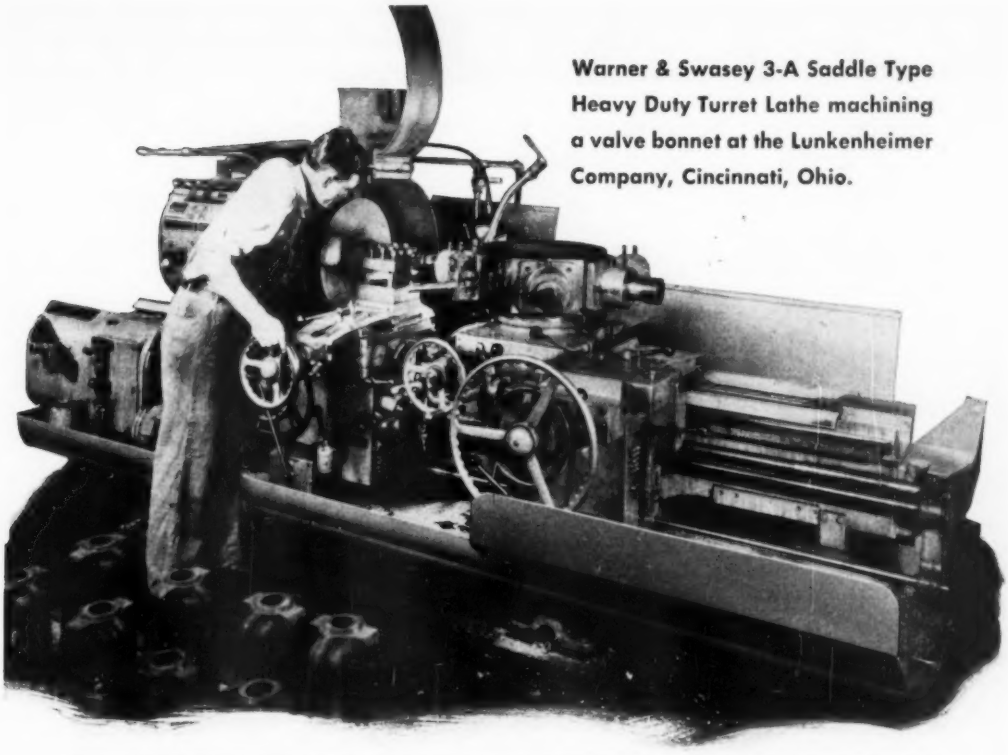
to this leading valve manufacturer

THE LUNKENHEIMER COMPANY recently completed a multi-million dollar modernization program. For the turret lathe phase of the program, Lunkenheimer turned to Warner & Swasey—and is now enjoying savings in production time and costs. As shown in the chart at the right, these time savings range all the way from 31% to 74%!

And what do the Lunkenheimer results suggest to you? Chances are, that it will pay you to call or write your nearest Warner & Swasey representative. He'll be glad to translate this story into terms of *your* operation.

WARNER & SWASEY SELLS ONE THING
. . . INCREASED PRODUCTION

TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, PRECISION TAPPING AND THREADING MACHINES



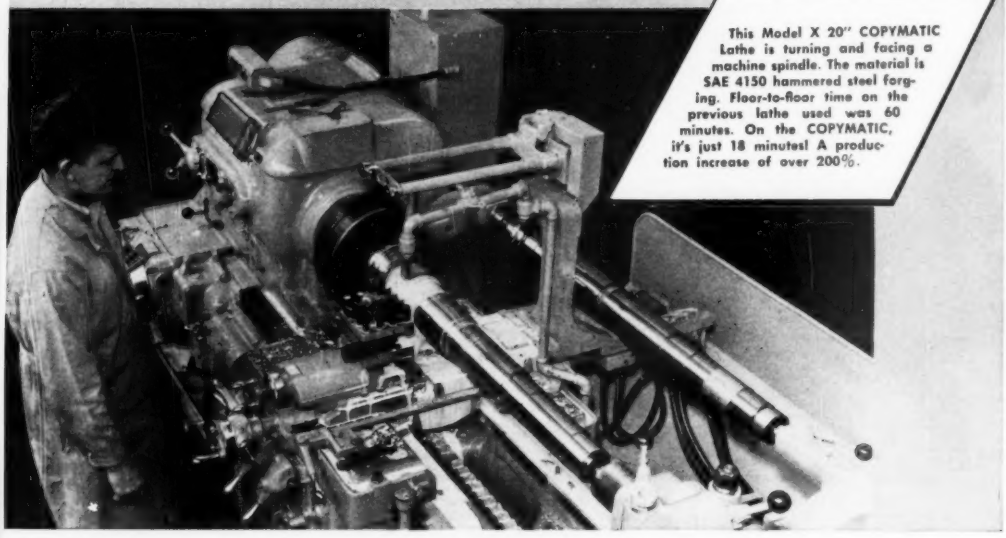
Warner & Swasey 3-A Saddle Type Heavy Duty Turret Lathe machining a valve bonnet at the Lunkenheimer Company, Cincinnati, Ohio.

Warner & Swasey TURRET LATHE	OPERATION	TIME SAVED
No. 5 Universal	Cut and Face for Bottom Plug of Valve Body	55%
No. 5 Universal	Finish both Welding Ends of Valve Body	40%
No. 2 or No. 3 Universal	Cut and Burr Yoke Bushings	66%
No. 4 Universal	Cut Yoke Bushings end of Valve Body	48%
No. 4 Universal	Cut and Tap for Seat Ring, Turn and Face Yoke Flange	43%
No. 2 or No. 3 Universal	Cut and Burr Gage Valve Yoke Bushing	74%
No. 3 Universal	Turn, Face and Chase body end of Seat Rings	41%
3-A Heavy Duty	Bore and Face Handwheels	65%
4-A Heavy Duty	Cut and Tap stem end of Gate Valve Disc	31%
2-A Heavy Duty	Turn, Bore, and Face Gate Valve Seat Ring	42%
2-A Heavy Duty	Bore, Finish Tongue and Cut off Disc Rings	34%
	AVERAGE	49%

WARNER & SWASEY
Machine Tools
Cleveland

FIGURE YOUR ANNUAL SAVINGS ...*if this machine were producing for you*

70% TIME SAVED...
OVER 200% PRODUCTION INCREASE



This Model X 20" COPYMATIC Lathe is turning and facing a machine spindle. The material is SAE 4150 hammered steel forging. Floor-to-floor time on the previous lathe used was 60 minutes. On the COPYMATIC, it's just 18 minutes! A production increase of over 200%.

...with a Lodge & Shipley Copymatic Lathe!

Too often, failure to replace machinery means failure to produce profitably. Length of service or age is not the only factor to be considered. Lathes only a few years old may be badly outmoded when compared with new, improved machines *on a productive basis.*

The versatility and productive capacity of the COPYMATIC highly recommends it as an economical replacement. In case history reports, *by the owners,* Lodge & Shipley COPYMATICS outproduce competitive machines by significant margins. At Link-Belt Co., "Turning time cut ½." At Otis Engineering Corp., the COPYMATIC is "1st choice . . . saves 30% of time." At Continental Motors Corp., "lower tooling cost—speedy change-over." At Wyman-Gordon Co., "A time saving of 50% over other lathes."

Your Lodge & Shipley representative will gladly show you how COPYMATICS will actually save you money, speed and improve production at the same time. For details on the COPYMATIC, ask for Bulletin No. 675.

Before buying any lathe, check especially the "profit features" proved important by Lodge & Shipley users. Write for new booklet No. 200 C. L. giving detailed information on Lodge & Shipley "Profit Features."

THE Lodge & Shipley COMPANY
MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

There's a UNION *twist drill for top performance on every operation!*

Whether you're working on the hardest alloy steel or softest iron . . . on such non-ferrous metals as brass, copper, aluminum, magnesium or zinc . . . on slate, marble, rubber, plastics, wood or any other non-metal . . . there's a type of Union Twist Drill that will give you tops in accurate, trouble-free, money-saving performance.

That goes, too, for a normal working pace or for high production records . . . and for every type of drilling equipment. No matter what the material or the conditions, *you're sure of best results when you specify Union!*

Union Twist Drills, Straight and Taper Shank High Speed Steel, with Blue Oxide Surface Treatment.

SERVICE THAT SAVES YOU TIME, TROUBLE, MONEY

Union Twist Drills are made in designs that cover the broadest range of operations. To aid you in choosing exactly the right type and size of drill for your particular applications — usual or unusual — your Union service man offers expert assistance. Call on him any time.

no other twist drill will outperform a UNION

contact your local distributor

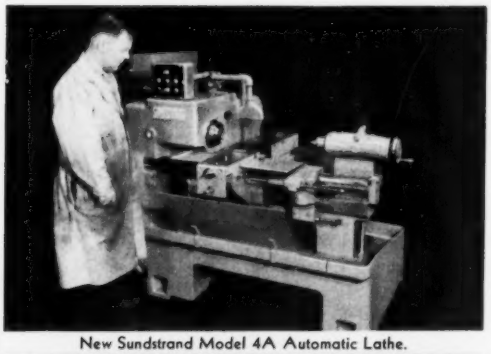
His name is listed in Union's THOMAS' REGISTER insert under "Drills, Twist."

UNION TWIST DRILL COMPANY, ATHOL, MASSACHUSETTS

Milling Cutters · Gear Cutters · Twist Drills · Hobs · Reamers · Carbide Tools

We own and operate S. W. CARD MANUFACTURING CO. Division, Mansfield, Mass. Taps, Dies, Screw Plates . . . BUTTERFIELD DIVISION, Derby Line, Vt., Taps, Dies, Screw Plates, Reamers . . . BUTTERFIELD DIVISION, Rock Island, Que., Milling Cutters, Twist Drills, Hobs, Reamers, Taps, Dies, Screw Plates.

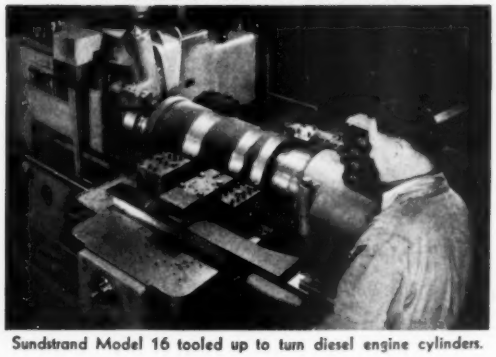
Why You'll Get Better Production With These New SUNDSTRAND Automatic Lathes



New Sundstrand Model 4A Automatic Lathe.

New Sundstrand Model 8A Automatic Lathe.

New Sundstrand Model 12A Automatic Lathe.



Sundstrand Model 16 tooled up to turn diesel engine cylinders.

The over 8,000 users of Sundstrand Lathes have always found them a profitable investment. Many have changed from old to new Sundstrands and received the benefits of the higher productivity resulting from design improvements. The following features incorporated in the design of the latest models of Sundstrand Automatic Lathes will help you cut costs further. Call in a Sundstrand engineer to assist you in selecting the proper method and machine for your work. There is no obligation for this service.

You'll Get Greater Horsepower

All new Sundstrand Automatic Lathes have been redesigned for greater rigidity and larger spindle drive motors. They have ample power for use of carbide cutting tools and are capable of doing more work. Note the massive headstock design in the machines illustrated.

You'll Get a Wider Feed Range

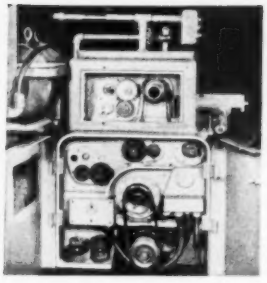
A wider feed range has been provided to enable the handling of a greater range of parts and materials at maximum cutting efficiency. The new Models 4A, 8A, and 12A have a ratio of 18 to 1 between high and low feeds — Model 16 has an even greater range.

You'll Get Greater Carriage Adjustment

Both front and rear carriage of the latest Sundstrand Automatic Lathes are adjustable full length between headstock and tailstock centers — another important new feature.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT



You'll Get Faster Set-Up

The photo at the left is an end view of machine showing convenient location of pick-off gears for changing spindle speeds and front and rear carriage feeds. The feed and speed chart and pick-off gear storage compartment are all readily accessible for quick set-up or changeover.

You'll Get a Wider Speed Range

Spindle speed range ratios have been increased to 30 to 1 on all new Model Sundstrand Automatic Lathes to obtain maximum in cutting efficiency over a wider range of sizes of parts and material. The spindle unit is equipped with two driving gear centers, which increase the range between high and low spindle speeds. In addition, four speed changes can be obtained from one set of gears instead of the usual two.

You'll Get Automatic Lubrication

To insure long machine life and lower maintenance costs, all moving parts within the machine, such as spindle bearings, gears, carriage and cross slide ways, are provided with automatic lubrication.

You'll Get Quick Cycle Change-Over

Complete control of all cycles is provided by adjustment of dogs on a disk. Making cams is eliminated. Changing position of dogs on disk changes length of rapid approach, feed and rapid return strokes — enables operator to set up cycle quickly and change over from one job to another easily.

You'll Get Automatic De-Clutching

All new Sundstrand models have been provided with automatic declutching between spindle and spindle motor with self-adjusting magnetic clutch and brake for quick stopping of spindle rotation.

You'll Get Screw Feed to Front Carriage

All new Sundstrand Automatic Lathes have screw instead of rack feed to the front carriage — resulting in fine finish and long tool life.

You'll Get Hardened and Ground Steel Carriage Ways

All new Model Sundstrand Automatic Lathes have hardened and ground carriage and cross slide ways.

4 Models Cover HP Range of 3 to 75 HP

	MODEL 4A	MODEL 8A	MODEL 12A	MODEL 16
SPINDLE MOTOR	3 to 10 HP	10 to 25 HP	20 to 50 HP	50 to 75 HP
SPEED RANGE (Type A) (Type B)	60 to 1800 RPM 120 to 3600 RPM	40 to 1200 RPM 80 to 2400 RPM	30 to 900 RPM 60 to 1800 RPM	15 to 750 RPM
FEED RANGE	.003 to .048 IPR.	.004 to .070 IPR	.004 to .070 IPR	.0025 to .100 IPR
FRONT CARRIAGE: Longitudinal feed with angular feed-in, max. Swing over cross slide, max. Rapid traverse rate	 5" 8¾" 275"	 6" 12½" 250"	 8" 15¼" 250"	 12" 17" 250"
REAR SLIDE: Max. Stroke	4"	5½"	6½"	8"
LENGTH BETWEEN CENTERS	15, 24 & 36"	24, 36, 48 & 60".	24, 36, 48 & 60"	36, 60 & 84"

FREE ADDITIONAL DATA

The complete new line of Sundstrand Automatic Lathes includes the Models 4A, 8A, 12A and 16 and they range from 3 to 75 HP. Write for complete information on these new machines today. Ask for Bulletins 103.

SUNDSTRAND MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

"MARVEL" HAS
always had the edge

MARVEL High-Speed-Edge Blades assure Faster, more Accurate cutting with proven Economy and complete Safety. Only the MARVEL is a composite blade with a high speed steel cutting edge electrically welded to an exceptionally tough, strong alloy steel body.

The High-Speed-Edge does the cutting while the alloy back, with hardened eyes, carries the load. Blade tensions up to 300% higher than those possible with ordinary blades are recommended. This greater tension is confined to the cutting or leading edge by the location of pin holes (exclusive MARVEL design feature) and cannot be overcome by work resistance. Heavier feeds and greater speeds are practical without "run out."

With greater accuracy, higher production and lower cost per cut, comes the extra dividend of Safety, for MARVEL High-Speed-Edge Hack Saw Blades are Positively Unbreakable—*they will not shatter.*

Ask your local MARVEL distributor (see classified phone book) to help you modernize your metal sawing with MARVEL High-Speed-Edge Blades. They cost no more than ordinary blades.

1. High-Speed-Steel cutting edge.

2. Tough unbreakable alloy steel body with hardened eyes.

1 & 2. Integrally welded to make a fast-cutting, long lasting composite blade that is *positively unbreakable.*

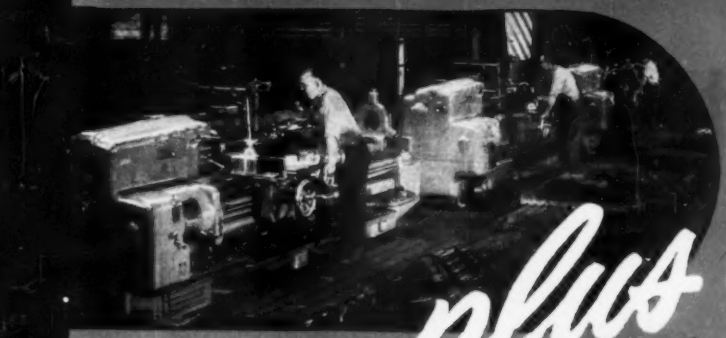
ARMSTRONG-BLUM MFG. COMPANY

"THE HACK SAW PEOPLE"

5700 BLOOMINGDALE AVENUE **CHICAGO 39, ILLINOIS**

MARVEL *Metal Cutting* SAWS

Better Machines—Better Blades



plus 3 minus 7

A Profitable Investment for *any* plant!

The world-renowned Otis Elevator Company recently installed three "AMERICAN" Duplicator Lathes which replaced seven engine lathes.

Such savings are the rule—not the exception—when "AMERICAN" Duplicators are put on the job.

These machines are performing "miracles" in savings in many of the largest and best known units of the metal working industry. They have introduced a new machining technique that has revolutionized the art of turning metal.

They reproduce work shapes from a template faithfully and accurately. They reproduce steps, tapers, right angle and tapered shoulders, recesses, grinding necks and radii, and are especially productive on such work as spindles, motor shafts, valve stems, back shafts, piston rods, axles and a wide variety of chucking work having irregular contours.

More and more the necessity of reducing manufacturing costs is crystallizing in the minds of management. The attention of directors, top officials and especially production executives is being focused to an increasingly greater degree upon cost-cutting equipment. It is inevitable, therefore, that the "AMERICAN" Hydraulic Duplicating Lathe should command the spotlight. Evidence from a hundred installations proves beyond a shadow of a doubt their leadership as top flight cost reducers.

If it's proof you want just drop us a line—no obligation.

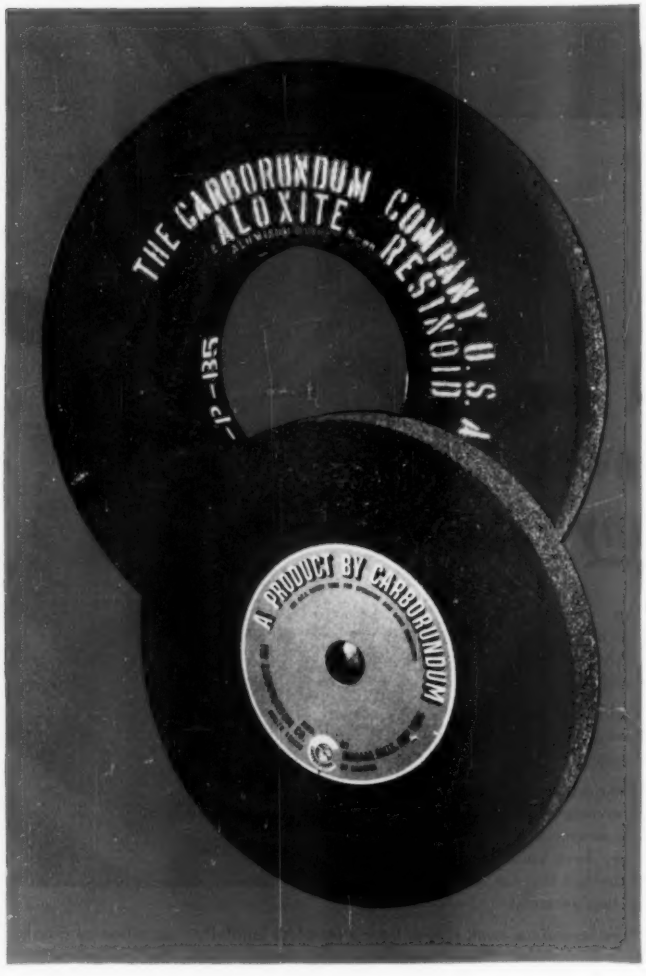
THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

It takes the RIGHT

OUR NEW and improved V10 Bond Wheel is especially designed for use on low-speed equipment for grinding high tensile strength materials. It is a revolutionary modification of an existing product.

TYPICAL OF NEW developments at **CARBORUNDUM** are improved B5 and B7N resinoid bond aluminum oxide and silicon carbide wheels for high-speed operations. They provide higher productivity with added safety and lessen operator fatigue.

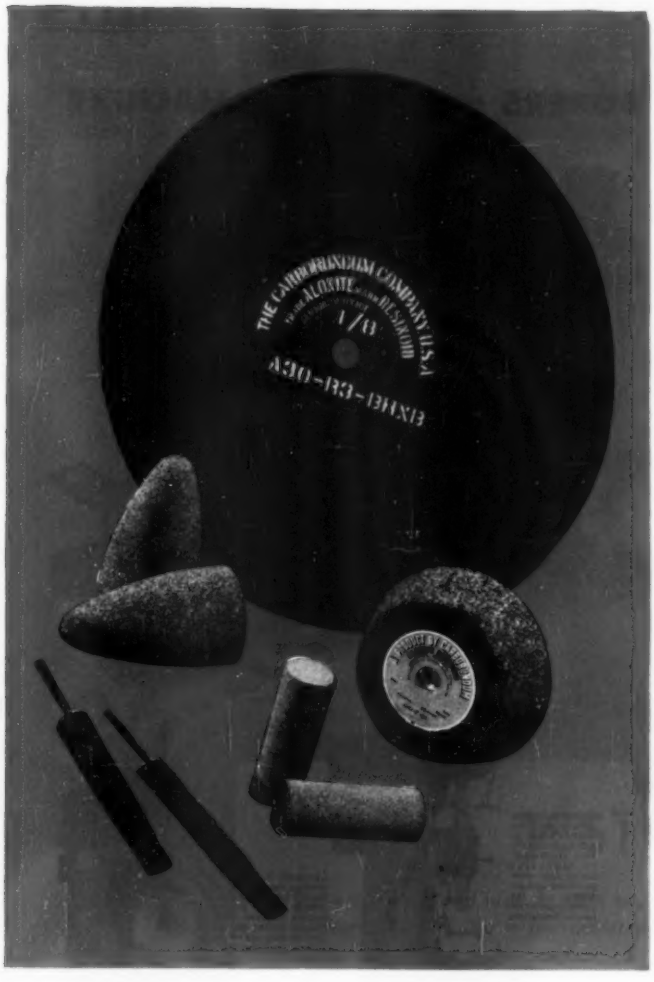


Only **CARBO**

TRADE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, N.Y.

Abrasive to do the job RIGHT



With production schedules stepped-up and costs on the rise, using the *right* abrasive becomes even more important in boosting output while effecting substantial savings.

CARBORUNDUM'S complete line of bonded abrasives includes the right product for every job. It covers the full range of high and low speed wheels, disc wheels, mounted points, rubs and other special abrasives. To meet changing job requirements, continual improvements and developments are made in both products and their application. That's why, when you call in CARBORUNDUM, you are assured of the *right* abrasive for the job...the most efficient...the most economical...impartially recommended.

ANOTHER recent development is the new VD Bond series of vitrified wheels ...establishing new records in grinding gray iron, hard malleables, semi-steel and non-ferrous metals.

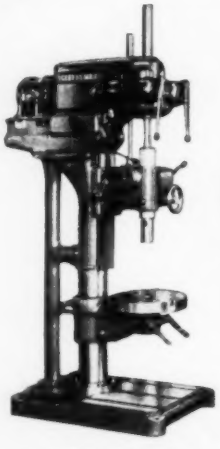
RUNDUM

MARK

makes ALL Abrasive Products...to give you the proper ONE

THE CLEEREMAN LINE

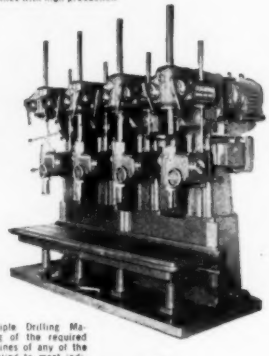
OF PRECISION JIG BORERS and DRILLING MACHINE



Cleereman Round Column Drilling Machines produce accurate holes at high speed and at low cost and are general purpose machines with high production.

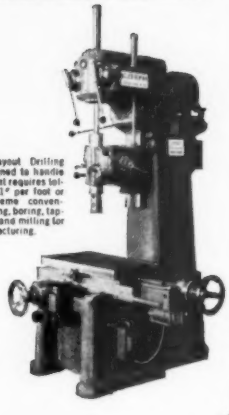
Cleereman Model 325 Single Unit Sliding Head Drilling Machines combine extreme sensitivity with rugged construction, are extremely versatile and may be used for production drilling and tapping.

Cleereman Jig Borers, noted for unexcelled precision, extreme accuracy, ease of operation in small lot production and in producing tools, dies, jigs or fixtures. Models available with electrically controlled prepositioning.



Cleereman Multiple Drilling Machines consisting of the required number of machines of any of the three types supplied to meet individual requirements.

Cleereman Box Column Drilling Machines have an exceptionally rigid construction for continuous heavy duty work combined with accuracy and the speed required for low cost production.



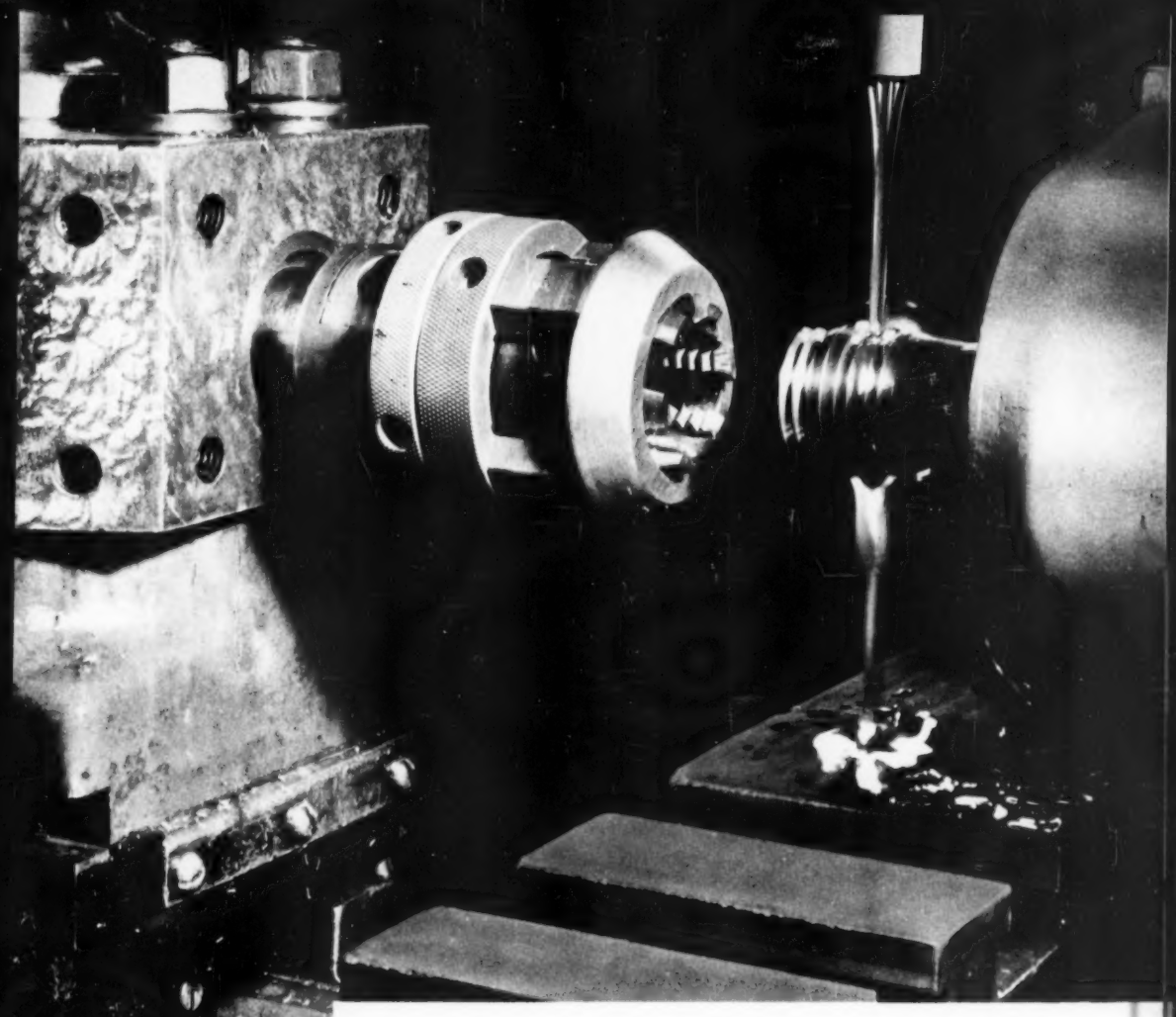
Cleereman Layout Drilling Machine designed to handle layout work that requires tolerances of .001" per foot or broader. Extreme convenience for drilling, boring, tapping, reaming and milling for Jigless manufacturing.

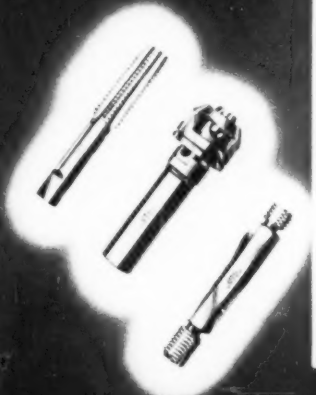
BRYANT
Machinery & Engineering
• Company •
General Office
400 West Madison Street, Chicago 6
Representatives in Principal Cities

Affiliated with—

CLEEREMAN MACHINE TOOL CO. Green Bay, Wis.

BUILDERS OF PRECISION JIG BORERS & DRILLING MACHINES





TEST PLUG

There are tests ***and*** tests, but the best one is actual performance.

Every "Acorn" Die is performance tested at the factory in an operating holder running at high speed on specially selected test stock.

The test plug is then gaged for pitch diameter, outside diameter and lead; and visually inspected under a glass for thread quality. Furthermore, the accepted plug is *packaged* with its own Die, tangible proof that the Die is *right*.

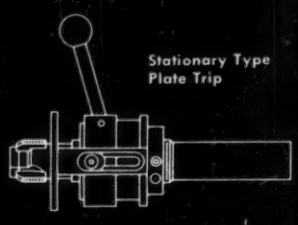
BUY DIES WITH *CONFIDENCE*
BUY *"ACORN"* DIES

GREENFIELD TAP AND DIE CORPORATION

GREENFIELD, MASSACHUSETTS

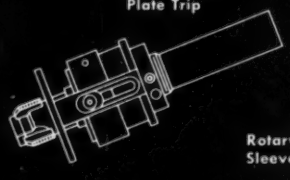
Geometric "S"

UNIVERSAL COLLAPSING TAPS

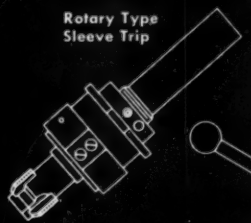


Stationary Type
Plate Trip

Rotary Type
Plate Trip

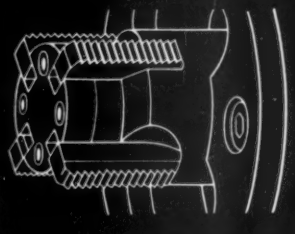


Rotary Type
Sleeve Trip



Stationary Type
Lever Trip

Bottoming Cap
For Tapping Blind Holes or
to Shoulder



Convertible into both Rotary and Stationary Types in eleven sizes and adaptable to most standard makes of machines without the need of additional parts, the Class "S" is indeed the UNIVERSAL COLLAPSING TAP.

Capacity $1\frac{5}{16}$" to $8\frac{1}{2}$" Straight Threads or 1" to 7" Pipe Threads

WRITE FOR LATEST BULLETIN S

BE SURE Buy GEOMETRIC

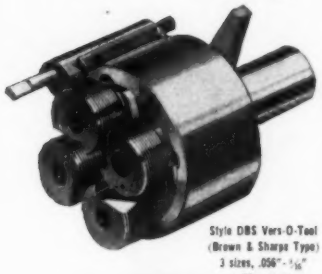
GEOMETRIC TOOL COMPANY DIVISION

GREENFIELD TAP AND DIE CORPORATION

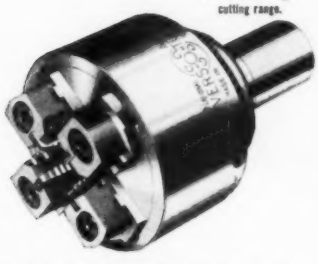
NEW HAVEN 15, CONNECTICUT

SIX REPORTS THAT POINT TO VERS-O-TOOLS

Style DS Vers-O-Tool (Non Revolving Type) 8 sizes, $\frac{1}{16}$"-4$\frac{7}{8}$" cutting range.



Style DBS Vers-O-Tool (Brown & Sharpe Type) 3 sizes, .056"-$\frac{1}{16}$" cutting range.



Style DR Vers-O-Tool (Revolving Type) 12 sizes $\frac{1}{16}$"-4$\frac{7}{8}$" cutting range with circular chasers; 6 sizes for adjustable blade chasers, $\frac{1}{16}$" to 1$\frac{5}{8}$" cutting range.

for lower threading costs

1 A Chicago manufacturer of electrical goods states, "We have run 173,000 $\frac{3}{8}$"-24 threads $\frac{1}{2}$" long on B-1113 with one grind of Vers-O-Tool chasers. This is at a circular chaser cost per grind of about 1$\frac{1}{2}$ mills per 1,000 pieces."

2 A large maker of brass fittings is getting 50,000 pieces per chaser grind on Vers-O-Tools equipped with Adjustable Blade Chasers cutting $\frac{5}{8}$"-8 Acme form double lead thread.

3 In one of the largest electrical plants a $\frac{9}{16}$" DR Vers-O-Tool threaded 30,000 $\frac{3}{8}$"-32 brass pieces without regrinding the circular chasers. The chaser cost was .007 cents per thousand pieces as compared with a cost of $1.60 per thousand by previous method.

4 On a No. 0 Brown and Sharpe, a brass specialty manufacturer reports on a DBS type Vers-O-Tool using hollow milling cutters running at 4150 RPM with a .0075" feed, consistently getting a 6-8 Micro inch finish—running for a year and grinding cutters once a week, average.

5 Operating $\frac{3}{8}$" DBS Vers-O-Tools with fine pitch Adjustable Blade Chasers, a screw products plant ran a lot of 20,000 stainless steel parts without chaser regrind or head adjustment. Customer adds—"Two sets of chasers paid for all threading equipment in first six months."

6 On a comparative test to determine threading chaser life and cost, a large plant makes this report on .099-56 threads based on two runs of 16,000 pieces: "Former tool cost $1.75 per 1,000 threads; $\frac{5}{16}$" DR Vers-O-Tool cost 10 cents per 1,000 threads."

Isolated endorsements are a dime a dozen. Taken individually, they don't prove a thing. But when customer after customer reports the same cost-cutting advantages, the same superior operational performances, the answer must lie in the Namco Vers-O-Tool's unique design and construction features.

Among these are the famous circular chaser, regrindable through a full 270°, the speed and accuracy of operation and the time-saving advantages of simplified set-up, easier regrinding. Moreover, the versatility of a single Vers-O-Tool head in handling threading or hollow milling, using either circular chasers or adjustable blade chasers—each interchangeable, size for size, on all three types of heads—means important economies in tooling costs. For more facts, ask for Catalog D-49.

The NATIONAL ACME CO.

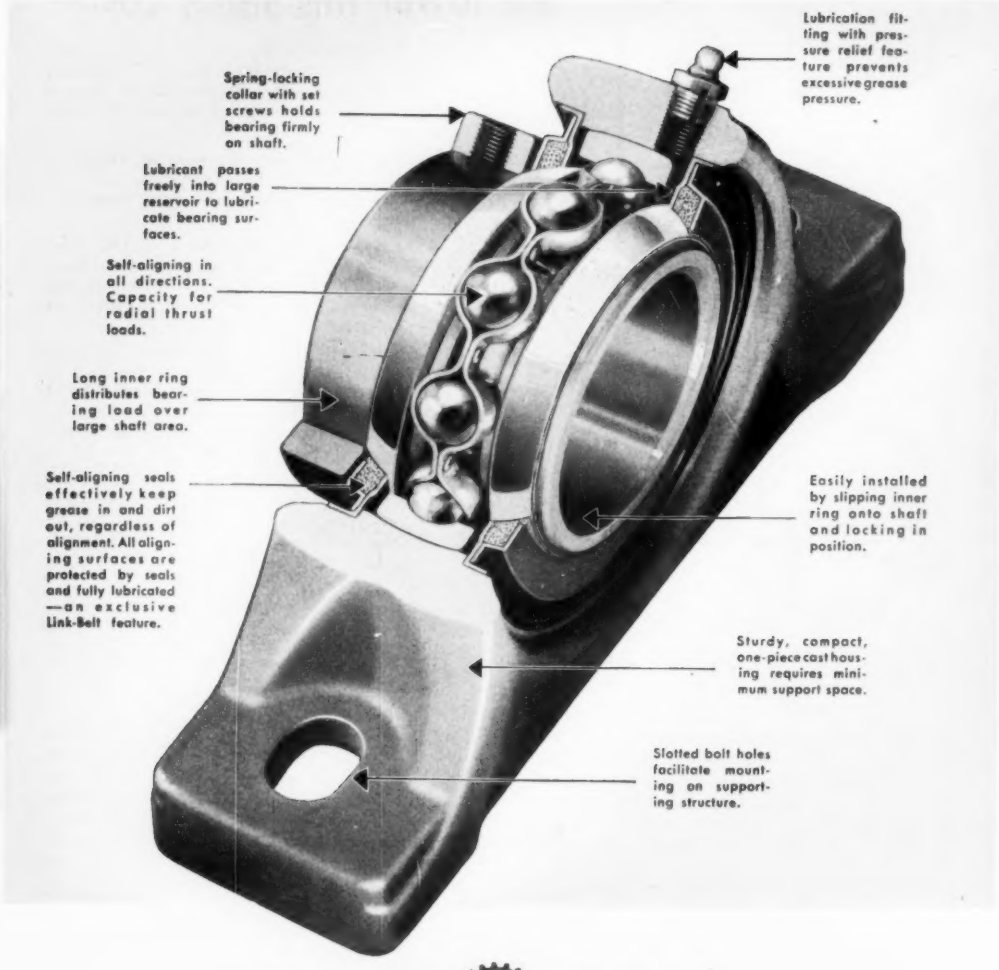
176 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley 4-6 and 8 Spindle Bar and Chucking Automatics • Single Spindle Automatics • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

by any standard...LINK-BELT

Refinements

assure longer ball and roller bearing performance


Lubrication fitting with pressure relief feature prevents excessive grease pressure.
Spring-locking collar with set screws holds bearing firmly on shaft.
Lubricant passes freely into large reservoir to lubricate bearing surfaces.
Self-aligning in all directions. Capacity for radial thrust loads.
Long inner ring distributes bearing load over large shaft area.
Self-aligning seals effectively keep grease in and dirt out, regardless of alignment. All aligning surfaces are protected by seals and fully lubricated —an exclusive Link-Belt feature.
Easily installed by slipping inner ring onto shaft and locking in position.
Sturdy, compact, one-piece cast housing requires minimum support space.
Slotted bolt holes facilitate mounting on supporting structure.

LINK-BELT

BALL AND ROLLER BEARINGS

LINK-BELT COMPANY: Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Johannesburg. Offices, Factory Branch Stores and Distributors in Principal Cities. 12.101

Want to CUT COSTS on these *Important* Portable Grinding Jobs?

For Heavy Metal Removal

For Grinding Hard-to-get-at Places

For Light Metal Removal

NO matter what combination of cutting action and length of wheel life you require for maximum economy on your portable grinding jobs, Norton Company, with its research facilities, engineering skill and wide product variety, can fill your requirements.

For Heavy Metal Removal — you'll like fast-cutting Norton grinding wheels of ALUNDUM or CRYSTOLON abrasive and resinoid or vitrified bond.

For Grinding Hard-to-get-at Places — you'll find a variety of Norton wheels available in just the right sizes and shapes to make this job easy.

For Light Metal Removal — you can't beat the latest Norton abrasive development, safe, easy-to-use *Reinforced* Hub Wheels.

NORTON COMPANY • WORCESTER 6, MASS.

Distributors In All Principal Cities

W-1327

NORTON ABRASIVES

Making better products to make other products better

Now available for oil hardening in entire range of thicknesses...

Brown & Sharpe Ground Flat Stock

For templates, cutting tools, gages, machine parts and many similar pieces, there's a type of Brown & Sharpe Stock exactly suited to your specific requirements.

To give you even greater benefits from the money-saving, time-saving advantages of accurately pre-ground stock, Brown & Sharpe offers a choice of oil or water hardening steel in 16 different thicknesses from 1/64" to 1".

In eight thicknesses up to and including 3/16", a single type of ground flat stock now serves for hardening in either oil or water . . . a distinct Brown & Sharpe feature.

With this complete range of 145 stock sizes, you can meet a wide variety of requirements. Stock for oil hardening is for parts with intricate sections, sharp corners or abrupt changes in form . . . for water hardening, where slightly higher hardness is needed.

Continuous, repeat markings of type on each piece of Brown & Sharpe Ground Flat Stock make identification easy. Protective envelopes in different colors simplify handling.

Write for new descriptive folder. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

Brown & Sharpe B·S

NEW! NORTON PRECISION BUSHING* Offers 3 Important Advantages

The new Norton-developed precision bushing is the latest step in the continuous Norton program to give you better grinding wheels—an important step in which was the opening of the new Norton grinding wheel plant two years ago.

1. IMPROVES WHEEL BALANCE

You get new standards of balance in *every* wheel produced in the new Norton plant. And the precision construction of this aluminum bushing preserves for you every bit of the improved balance molded into the wheel—thus bringing to you *all* the improved performance that comes from better wheel balance.

2. HAS MORE UNIFORM HOLE SIZE

This new Norton bushing gives you precision arbor fits because precision manufacture holds its hole size to closer tolerances than ever before achieved in any other grinding wheel bushing.

3. STRENGTHENS HOLDING POWER

The fluted construction on the outside of each Norton precision bushing *plus* the method of press-fitting it into the wheel give you double assurance of a firm grip, even in fine grit wheels.

AVAILABILITY—The new Norton precision bushing is now being used in straight wheels 5" to 8" diameter. Its use will be extended to other wheel shapes and sizes as rapidly as possible. Keep in touch with your Norton distributor for the latest news.

* PATENTED—ANOTHER EXCLUSIVE NORTON FEATURE

Making better products to make other products better

NORTON COMPANY, WORCESTER 6, MASS.

Warehouses in Five Cities — Plants in Six Countries
Distributors in All Principal Cities

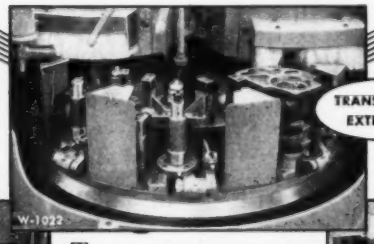
NORTON ABRASIVES

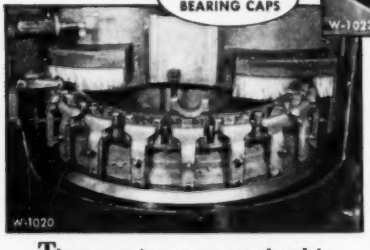
Put them on a Blanchard

NO. 16-A2 AUTOMATIC

This two-spindle surface grinder is a real producer. In a single pass, the work is roughed by one wheel and then finished by the second wheel. Because each wheel can be selected for its part of the grinding operation, without having to compromise between roughing and finishing, the No. 16-A2 is particularly suited to work requiring high production. Close limits are assured by automatic size control for each wheel. If you're looking for maximum results with minimum effort, get production details on just how fast your own work can be done on the No. 16-A2.

Send blueprints or samples — there is no charge or obligation.





These cast iron caps are placed in suitable stations, automatically clamped, ground, and automatically unclamped. 1020 caps per hour are ground to ±.003″, and flat to .002″ in a 20 station fixture. 1/16″ of stock is removed per side.

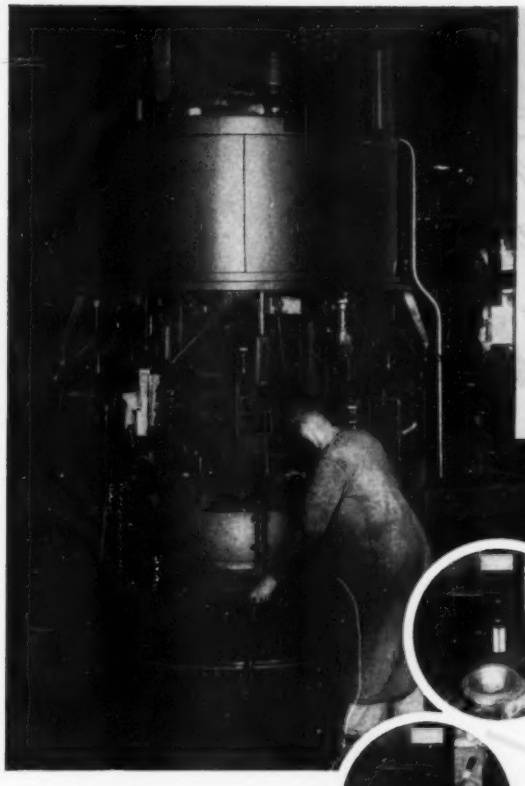
The joint face is ground by loading the cast iron part over a post, locating from a shoulder, supporting the flange by a spring bunter. It is clamped automatically. Parts are held flat to .001″, square with bore to .002″, and to ±.001″ for size. 84 pieces ground per hour on one side.

These cast iron parts are loaded with the flange under a "U" shaped block, clamped upward against the block. The four bearing surface "feet" are ground to limits of ±.003″, parallel to flange within .001″. 229 pieces are ground per hour on one side.

Send for your free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

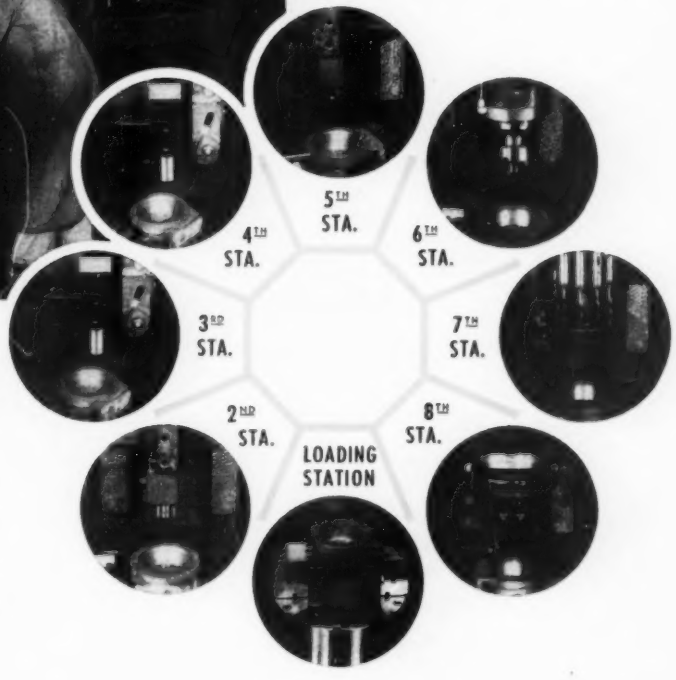
PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY 64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.



A KEY UNIT TO LOWER COSTS

Whether Mult-Au-Matics are tooled for Versatility on a variety of the shorter run jobs or tooled for volume production, users have for many years proclaimed these machines, "Key units in lowering our manufacturing costs".



1st Station—:
Loading

2nd Station—:
Rough Bore—Three Diameters

3rd Station—:
Rough Face—Three Surfaces

4th Station—:
Finish Face—Three Surfaces

5th Station—:
Finish Bore—Three Diameters and Chamfer

6th Station—:
Precision Bore—Two Diameters

7th Station—:
Multiple Drill—Ten Holes

8th Station—:
Multiple Tap—Ten Holes

Many of today's economic problems are being solved through lower manufacturing costs. A Mult-Au-Matic installation may be the solution to some of YOUR PROBLEMS.

Let Bullard engineers study your manufacturing methods with a view towards reducing your manufacturing cost via the Mult-Au-Matic Method. Write for Mult-Au-Matic "Pictorial".

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

NATCO Announces

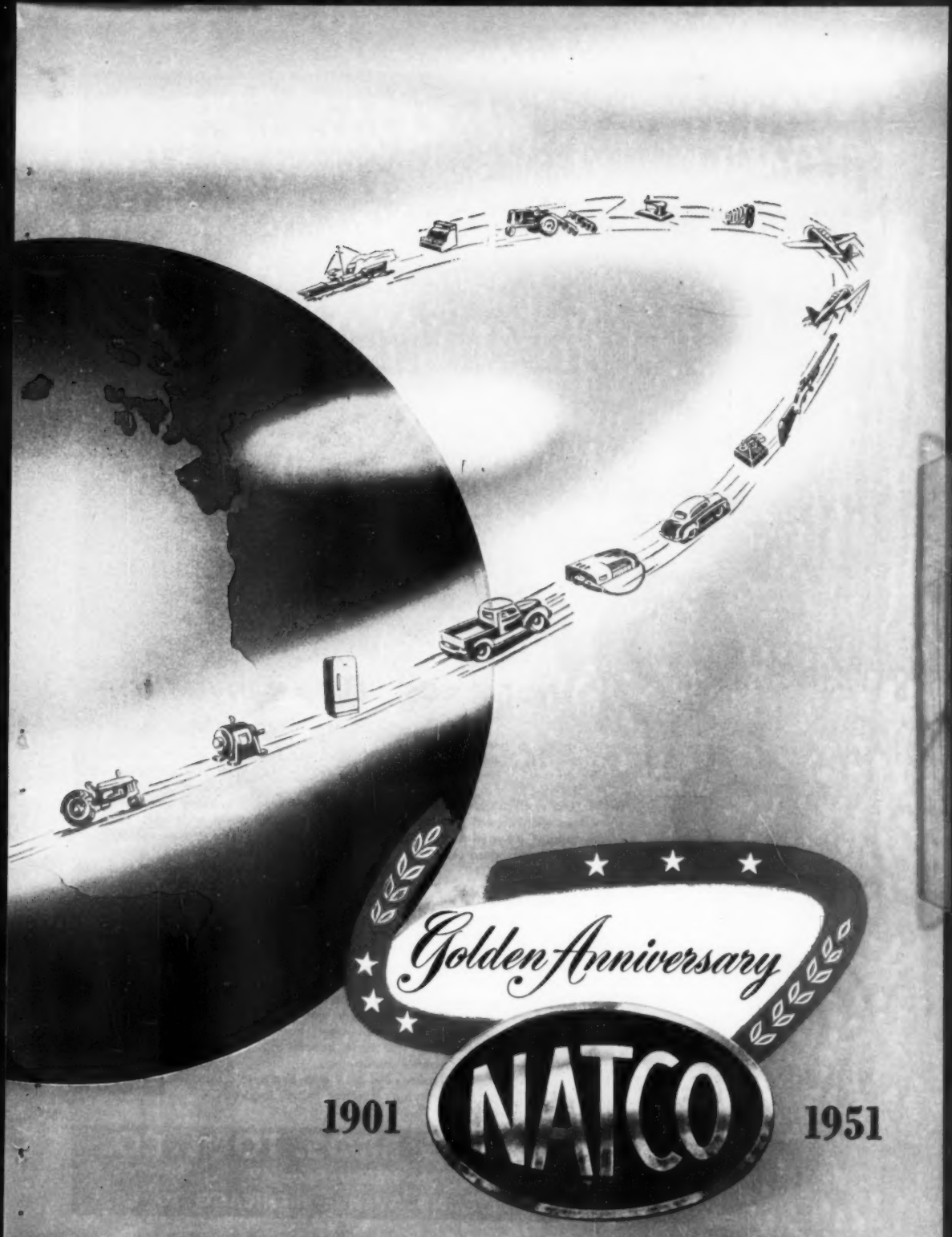
50 YEARS

of service to industry

The past fifty years have marked an epoch of scientific industrial advancement unparalleled in history. Tremendous accomplishments have been made in the development of automobiles, airplanes, electricity, electronics, telephones, television, radios, home appliances and atomic energy. Modern machine tools have helped to bring the better things in life within the reach of everyone . . . and to raise our standard of living to an unprecedented height. We at NATCO are proud of our contribution to this historic advancement. We deeply appreciate the faith and confidence of our customers and the service of the men and women of the NATCO organization who are responsible for the successful development of our Company.

It is our sincere hope that we may continue to serve industry and advance with it in the years to come.

NATIONAL AUTOMATIC TOOL COMPANY, INC., Richmond, Ind., U.S.A.


Golden Anniversary
1901
NATCO
1951

ARMSTRONG

Quality TOOLS

NOT A COST, BUT AN INVESTMENT

That Pays Year After Year. . .

Buy ARMSTRONG TOOL HOLDERS and TOOLS for today's job and they will bring you added profits thru the years. With ARMSTRONG TOOL HOLDERS you will be permanently tooled up for whatever comes, for each is a multi-purpose tool that takes cutter-bits ground to many shapes. Each is an efficient tool, refined thru a half century of world wide use. Each has strength beyond any need, extra strength resulting from endless research and the most modern closely controlled manufacturing methods.

ARMSTRONG TOOL HOLDERS are inexpensive too, for they are produced in great numbers. They are instantly available because they are carried in stock by all leading supply houses in sizes and types for every operation on lathes, planers, slotters and shapers; for standard operations on turret lathes and screw machines. They are profitable in use because they permit the highest speeds and heaviest feeds, and "Save: All Forging, 70% Grinding and 90% High Speed Steel."

ARMSTRONG Lathe and Milling Machine Dogs are permanent tools too. They are drop-forged from special open hearth steel, are heat treated to extreme stiffness and toughness. They have alloy steel screws hardened at the tip to prevent up-setting and have double life, for hubs are made oversize to permit re-tapping.

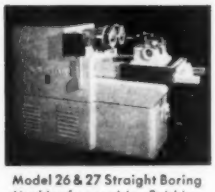
ARMSTRONG Quality pays back over and over again. *Write for new S-48 catalog.* It offers many opportunities to conserve profits.

ARMSTRONG BROS. TOOL CO.

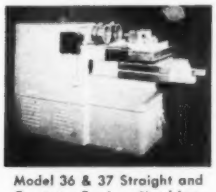
"The Tool Holder People"

5215 W. ARMSTRONG AVENUE • CHICAGO 30, ILL.

Announcing



Model 26 & 27 Straight Boring Machine for precision finishing operations on a wide range of work.



Model 36 & 37 Straight and Contour Boring Machine, single point bores, turns, faces, contours, and positively repeats with extreme accuracy.

. . . the addition of a new double-ender to our regular line of precision boring machines

This new double-ender rounds out our established group of precision boring machines and permits us to offer a complete line. The Model 50 is equipped with our exclusive New Britain high speed boring spindles. The hydraulic system is a completely separate unit which can be easily disconnected for cleaning and servicing.

Tooling set-ups and types of pieces machined depend entirely upon the ingenuity of the production engineer. For this reason we invite your inquiries on this kind of work and offer our complete estimating experience to help you tool up for profitable production.

NEW BRITAIN
Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING, DRILLING AND MILLING MACHINES

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributors: Bethlehem Steel Export Corporation

150,000 Stainless Spoons from Striking Dies of XX Carbon

The shaping of stainless steel can be a tricky job. A leading cutlery maker, faced with new problems in starting the production of stainless flatware, asked Bethlehem to recommend a tool steel suitable for striking dies. (The master dies are hand-engraved by craftsmen in the traditional fashion of this intricate art.)

The manufacturer adopted our recommendation of Bethlehem XX Carbon Tool Steel for this difficult operation. Results have been highly satisfactory. Spoons and other flatware are struck in quantities exceeding 150,000 pieces from one impression of the striking dies.

XX Carbon Tool Steel offers many advantages for general-purpose tools and dies. It's easy to machine and heat-treat; it develops a hard case, reinforced by a tough, shock-resisting core; it holds a keen cutting edge; it's economical; and there's a range of carbon content to meet many different requirements.

We closely control the hardenability of this grade, and give it a careful and uniform spheroidize-anneal. Bethlehem Carbon Tool Steels are the kind you can rely on for top performance.

Our Tool Steel Engineer Says:

Use thermocouple when you pack-harden tools

Whenever tools are pack-hardened (to reduce the scaling and decarburization) place a thermocouple *in the pack* against the tools so that the time the *tools* are at heat can be determined accurately.

Recently a 34-in.-diameter die ring of our Lehigh H (high-carbon, high-chromium) Tool Steel was pack-hardened by an experienced heat-treater. Treatment completed, he checked the hardness and was flabbergasted to find that he had obtained a hardness of only Rockwell C-48. Then he checked his pyrometer charts which proved, he thought, that he had followed the recommended heating cycle. Why the low hardness?

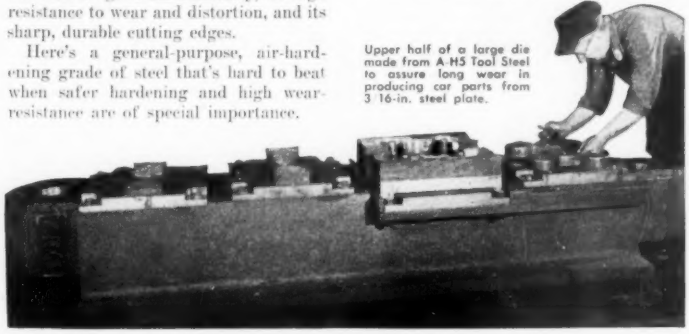
A Bethlehem trouble-shooter suggested that he insert a thermocouple in the pack against the ring. He did so, and this time got a hardness of Rockwell C-60—proving that in the first treatment the die ring wasn't heated long enough to reach the proper temperature, even though the records of the furnace heating cycle appeared to indicate correct treatment.

BIG DIE OF A-H5 MAKES CAR PARTS

A massive die produces spring plates from 3/16-in. steel plate for hopper cars, at the Berwick, Pa., plant of American Car & Foundry. All wearing surfaces of the die, which performs a punching, blanking, and forming operation, are made of A-H5 Tool Steel.

This leading car-builder uses this 5-pct-chromium, air-hardening tool steel to produce car parts from carbon steel, low-alloy high-tensile steel, and aluminum. A.C.F.'s experience with A-H5 confirms its good machinability, its high resistance to wear and distortion, and its sharp, durable cutting edges.

Here's a general-purpose, air-hardening grade of steel that's hard to beat when safer hardening and high wear-resistance are of special importance.



Upper half of a large die made from A-H5 Tool Steel to assure long wear in producing car parts from 3 16-in. steel plate.

Prompt shipment to our distributors is made possible by our modern tool-steel depot at Bethlehem, Pa. Complete sizes of 23 different grades are stocked.

Tool Steel Distributors Give Service in a Hurry

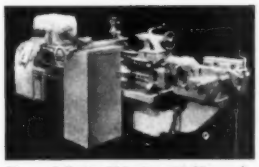
Delivering tool steel in a hurry is only one of the many services performed by the distributor. He knows local requirements, and he carries large stocks of the tool steel grades and sizes that his customers are most likely to require. He's ready at any time to go into action to see that your tool steel needs are taken care of, whether it means cutting bars to exact size or lending a hand in recommending the kind of heat-treatment you'll need.

Having a tool-steel distributor in your neighborhood makes it unnecessary for you to carry large inventories of tool steel . . . and he often carries other steel specialties that you use frequently.

Distributors of Bethlehem Tool Steels are reputable, experienced firms. They render a real service in all parts of the country. We are proud to have them so closely linked with our sales organization.

Bethlehem ULTRASONIC TESTED **Tool Steel**

Get the Point?



Monarch Series 60 Lathe with Monarch-Keller controls. These controls can be factory-applied to all Monarch Engine and Toolmakers Lathes, 14" size and up.

You're looking at the stylus of a Monarch-Keller Form Turning, Boring and Facing Machine. Wherever you spot an installation, you'll get the point immediately—here's a shop using modern duplicating methods to reach peak production at maximum profit. Here's a shop reproducing template contours to tolerances of .001" or less. And here's a shop with work coming through *fast* (we can substantiate actual time savings of 400-500%!). It's a good point, if it's in *your* shop. But it's tough, if it's competition.

Many advantages are offered by this first of all tracer controlled turning methods—in which Monarch has now accumulated 21 years of experience. Range and metal removing capacity are in no way limited by controls. It provides a unique universal stylus movement, thus effecting substantial time savings on many work pieces. It is recommended for the more intricate shaped molds and dies, for form rolls and for many intricately shaped parts.

Let us point out too, that only Monarch can deliver your choice of three tracer controlled duplicating systems according to your needs. They are fully described in the three booklets mentioned in the coupon. Just indicate your interest, and we'll send you the ones you wish. *The Monarch Machine Tool Company, Sidney, Ohio.*

Push button control cabinet (above), electric tracer and magnetic clutches constitute system. It can be instantly disconnected for regular lathe work under manual control.

Monarch
TURNING MACHINES

ACCURACY • ECONOMY • LONG LIFE

FOR A GOOD TURN FASTER...TURN TO MONARCH

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

Gentlemen: Please send without obligation the following complete Bulletins:

- ☐ Bulletin No. 2401—Monarch-Keller Controls
- ☐ Bulletin No. 2606—The Monarch Air-Gage Tracer
- ☐ Bulletin No. 2302—The Monarch Motor-Trace

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

machined and *Assembled* in *One Chucking!* with GISHOLT TURRET LATHES

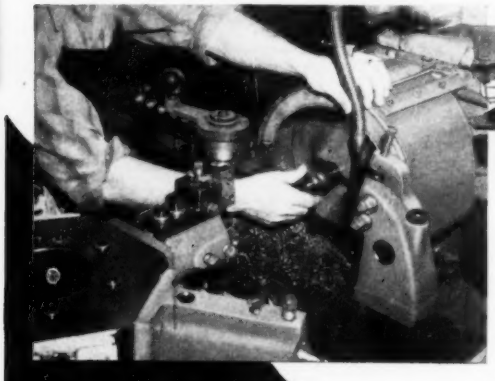
Talk about clever ideas! Here's one used by the Ansul Chemical Company, manufacturer of dry chemical fire extinguishers, to cut time, cut costs and do a better job.

Eight different operations on these gas pressure cartridges are performed on a Gisholt No. 5 Ram Type Turret Lathe as follows: Turn, face, bore, thread, tap, attach splined collar, groove collar, and roll edge. And all in one chucking!

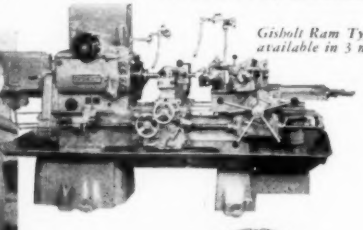
Combining all these operations on a Gisholt Turret Lathe eliminates another handling and welding operation—saves from 30% to 40% of former time. What's more, it has resulted in more uniform work and better appearance.

It's another example of using ingenuity to save money. Gisholt engineers are ready to give you the best of their experience—to help cut *your* time and costs. Write us.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin



While part is still turning, splined collar is placed over neck of cartridge. Collar is then grooved and rolled to insure a snug fit that prevents turning or loosening.



Gisholt Ram Type Turret Lathes are available in 3 models with standard chuck sizes ranging from 8" to 15".

GISHOLT

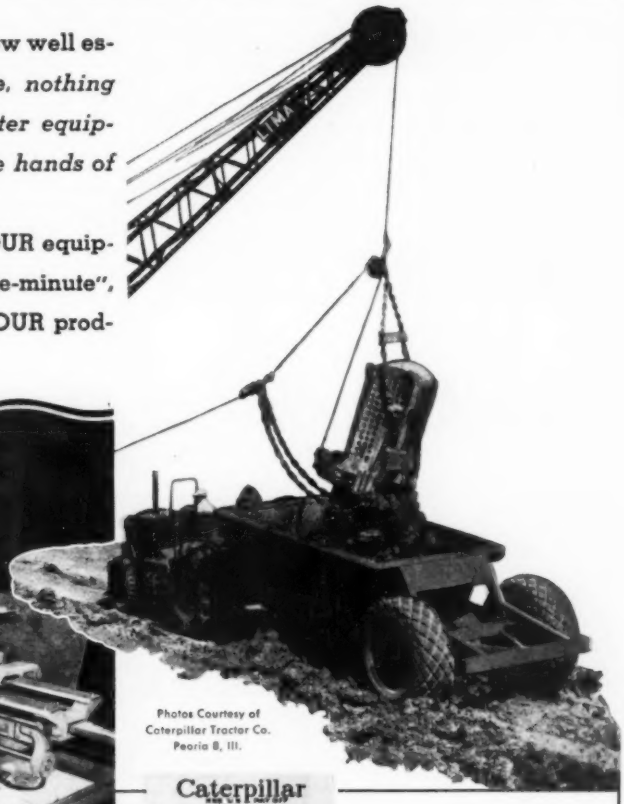
The Gisholt Round Table *represents the collective experience of specialists in the machining, surface-finishing, and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Your keenest competitor knows

That no matter how well established his business may be, *nothing can damage it more than better equipment and better methods in the hands of an aggressive rival!*

He also knows that unless YOUR equipment and methods are "up-to-the-minute", YOU cannot continue to sell YOUR products at competitive prices.



Photos Courtesy of Caterpillar Tractor Co. Peoria 8, Ill.

Caterpillar

Here's a big manufacturer, builder of big machines, who knows the competitive advantages of Jones & Lamson Turret Lathes! CATERPILLAR TRACTOR CO. —world famous producer of Diesel Engines, Tractors, Motor Graders and Earth-moving Equipment—makes sure of top-flight production economy by concentrating on up-to-the-minute machines and methods. Meeting production schedules on Caterpillar's turret lathe jobs, like the husky malleable iron Adjustable Bearing shown here, calls for the last word in turning equipment. To bore, turn, face and chamfer such parts, at peak efficiency, takes a fast, heavy-duty turret lathe with reserves of *Speed, Power, Rigidity and Repetitive Accuracy. It takes a J & L!*

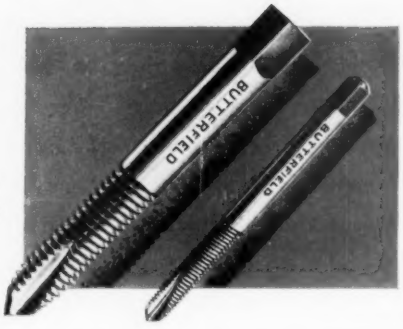
Are YOU equipped to YOUR best advantage? Get a free check-up on your present operations. Write today to Jones & Lamson's PRODUCTION RESEARCH DEPARTMENT for this service.

Turret Lathes—Fay Automatic Lathes—Thread Grinders—Optical Comparators—Threading Dies

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

Butterfield Announces the Newest. . .

STUB FLUTE PRODUCTION TAPS. Especially designed for threading holes in thin sections, where depth of thread required is no more than the tap's diameter. Available in High Speed Commercial Ground fractional sizes (left) and machine screw sizes (right), these rugged, hard-hitting production taps are made to standard dimensions of spiral pointed taps, except for the short stub flute that provides extra strength.



in a famous line that includes. . .

SPIRAL FLUTE TAPS. Right hand cut, right hand spiral flutes with the correct degree of spiral allowing tap to cut freely while ejecting chips from hole. This design causes chips to spiral up and out of blind holes that have little or no chip room at the bottom.

PIPE TAPS. Straight or taper in high speed and carbon steel. High Speed Ground or Cut Thread taps available in regular or interrupted thread. Two distinct styles—one for steel and similar materials; another for cast iron and other such materials.

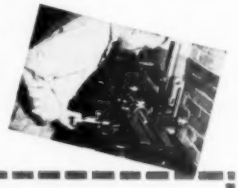
STANDARD HAND TAPS. Fractional and machine screw sizes, in high speed or carbon steel, are available in various styles—Taper, Plug, Bottoming and Spiral Point. High speed taps furnished in Commercial Ground, Precision Ground or Cut Thread.

and. . .

Stove Bolt Taps • Pulley Taps
Staybolt Taps • Boiler Taps
Nut Taps • Serial Taps • Tapper Taps
Mud or Washout Taps

All *Individually* Inspected . . . All Promptly Available From Your Nearby Butterfield Distributor

Checking pitch diameter, thread form and lead on a Zeiss Universal Measuring Microscope.



Union Twist Drill Company
BUTTERFIELD DIVISION
Derby Line, Vermont
In Canada: Rock Island, Quebec

BUTTERFIELD

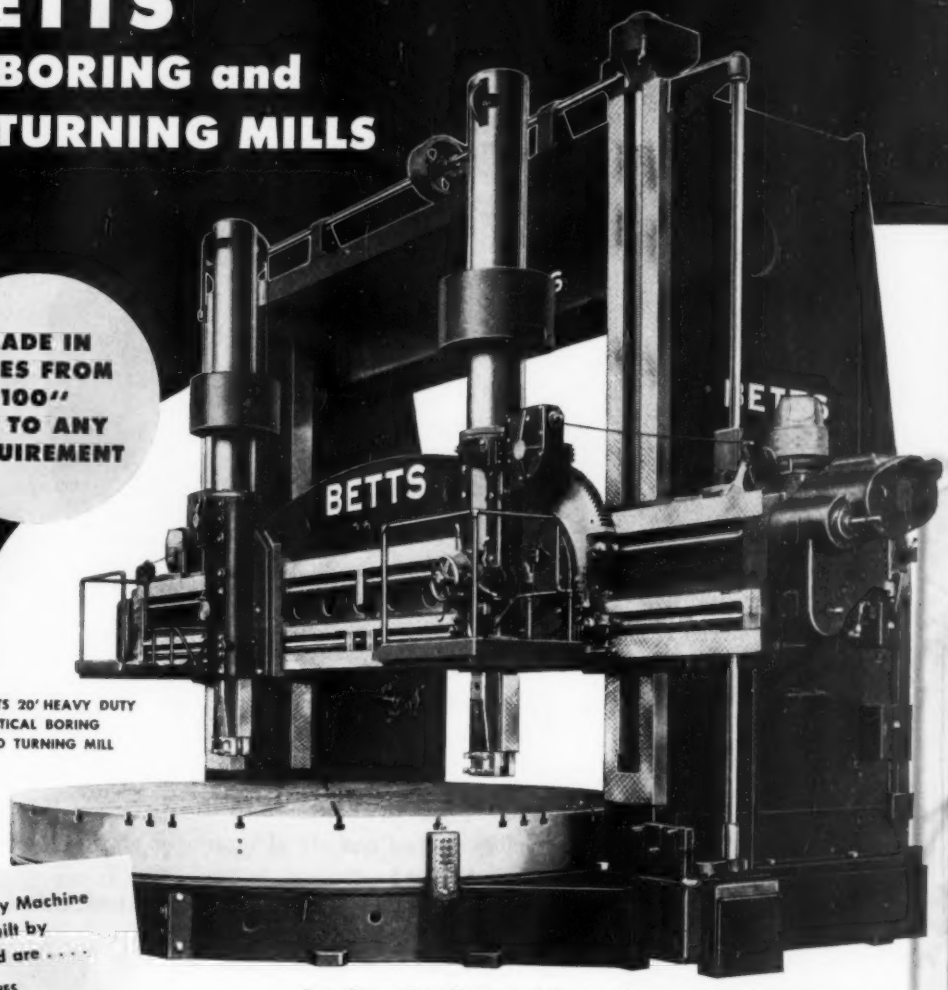
THE 100% INSPECTED TOOLS

Every Tool Individually Inspected

TAPS • DIES • REAMERS • SCREW PLATES

BETTS
BORING and TURNING MILLS

MADE IN SIZES FROM 100" UP TO ANY REQUIREMENT



BETTS 20' HEAVY DUTY VERTICAL BORING AND TURNING MILL

Among Heavy Machine Tools built by Consolidated are . . . .

- LATHES
- BORING MILLS
- DRILL PRESSES
- MILLING MACHINES
- BORING MACHINES
- COLD SAW MACHINES
- BORING, DRILLING AND MILLING MACHINES
- DRILL AND TOOL GRINDERS
- PLANERS
- SLOTTERS
- RAILROAD SHOP TOOLS
- AUTOMOTIVE TOOLS
- AND OTHER SPECIAL MACHINES

Betts Heavy Duty Boring and Turning Mills are general purpose tools of simple, rugged design particulary adapted to heavy continuous operations requiring a high degree of accuracy combined with power. Among the outstanding features that have made Betts Mills leaders in their field, is their type of table mounting that insures positive concentricity. They are built in a size range from 100" swing up to any size to meet your requirements.

Full information covering any size Betts Boring and Turning Mill in which you are interested will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

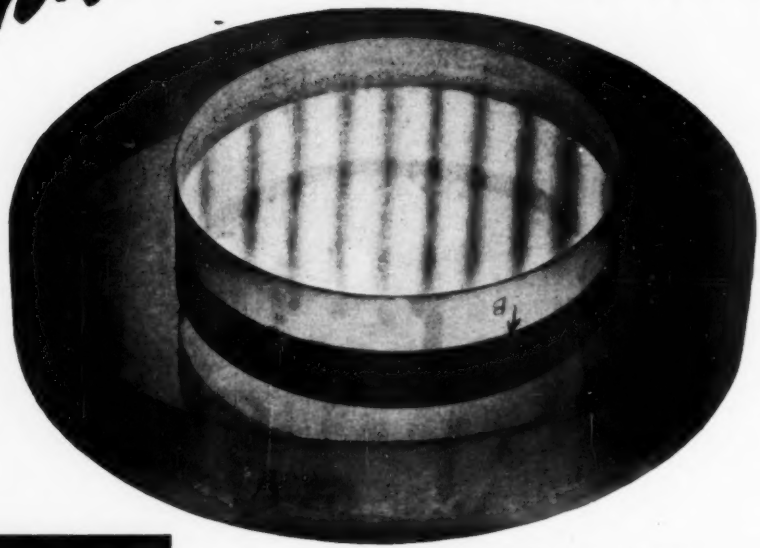
BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

Van Keuren OPTICAL FLATS
are the proof of Precision

BOSTON



NEW YORK

Detecting worn spot on amplifying gage anvil.

Checking flatness of lapped shoulder on a shaft with a special 3" diameter x 29/32" hole Fused Quartz Optical Flat.

IF the 10" diameter Van Keuren Master Flat shown above were extended from New York to Boston, the surface would deviate from a true plane less than 1".

Insist on having Van Keuren Fused Quartz Optical Flats. They are beautifully finished and are of superlative accuracy on both sides. They are the best buy.

IF YOU HAVE A PROBLEM

of testing flat surfaces, send us a sample part for examination and report.

CATALOG AND HANDBOOK No. 34

THIS 208-page volume represents 2 years of research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies free upon request.

THE Van Keuren CO., 173 WALTHAM STREET, WATERTOWN, MASS.

32nd YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

PINK ~~BLUE~~ RIBBON WINNER

for lowering metal cutting costs

When you see how CIMCOOL° lowers metal cutting costs in your plant, you'll heartily agree it deserves a first place award. This revolutionary cutting fluid—this **chemical emulsion**—saves you money in three important ways:

CIMCOOL INCREASES TOOL LIFE (and thus reduces down time) because of its **chemical lubricity.**

FASTER SPEEDS are possible because Cimcool cools faster, through a unique physical change in the cutting fluid itself. Tools and chips actually stay cool to the touch.

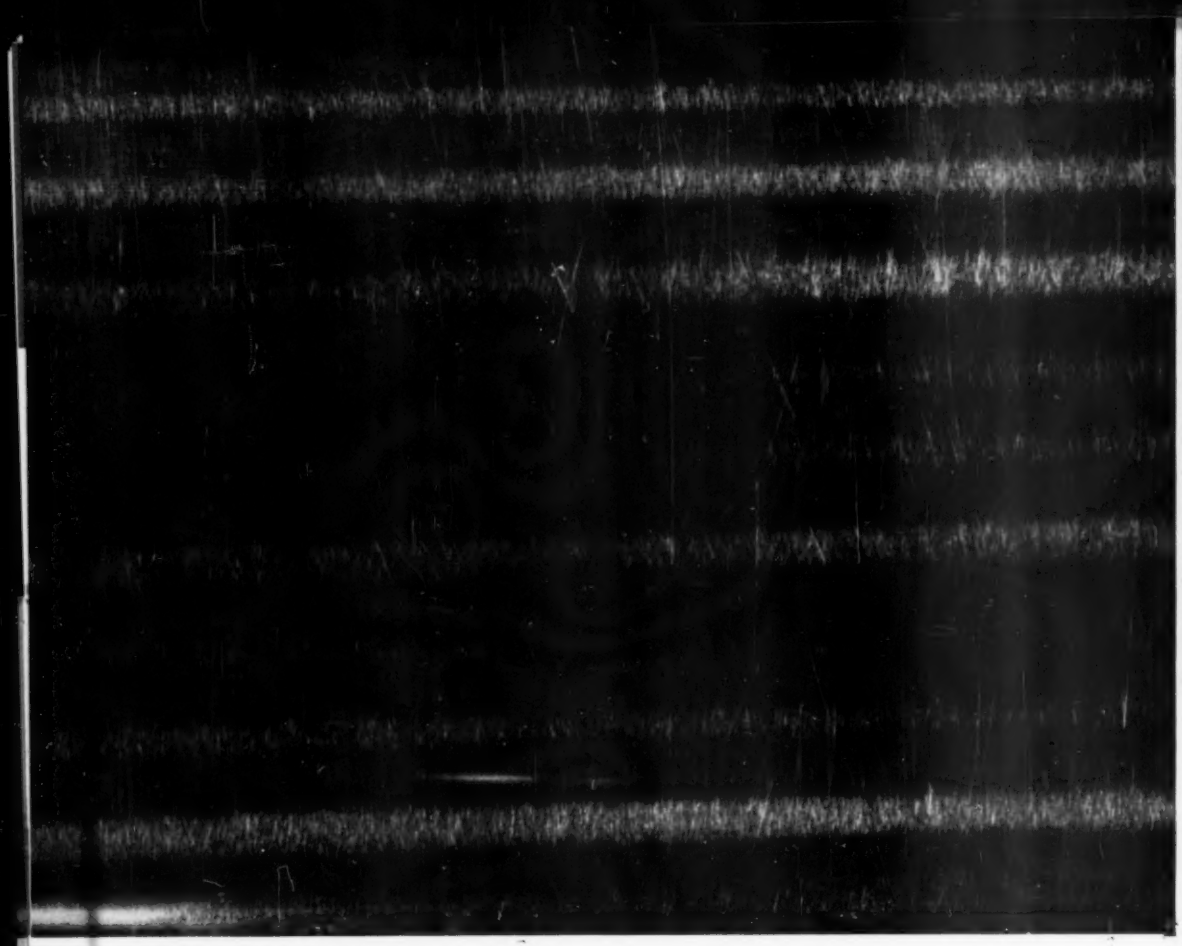
CIMCOOL COSTS LESS than old-fashioned cutting fluids because it lasts longer. It cuts cost of cleaning and changing. It virtually eliminates rancidity and foul odors. And because of its low surface tension and low adhesion to work and chips, there is practically no carry off.

We sincerely believe one test run will convince you. And we're prepared to provide a demonstration in one of your own machines. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you. Or if you prefer, write for our free booklet "CIMCOOL Gives the Answers." Address, Sales Manager, CIMCOOL Division, The Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for **85%**
OF ALL METAL CUTTING JOBS



This roll looked perfect...

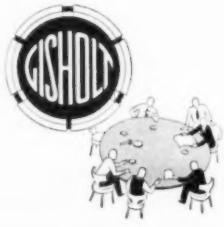
until SUPERFINISH revealed these defects!

Everybody said it was as perfect a finish as you'd ever see. A 12" steel roll ground down to a smoothness of less than 2 micro inches—dazzlingly reflective from end to end. Not a visible defect *—on the surface.*

But when SUPERFINISHING began, some interesting marks appeared—longitudinal flat spots—defects produced by the prior operation and then covered up by the heat of grinding.

SUPERFINISH brings these hidden troubles out in the open—out where you can see them and recognize the cause. And if your troubles are not too serious, SUPERFINISH can correct them economically and fast.

If you have fine finish requirements it will pay you to write for the booklet "Wear and Surface Finish."



THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

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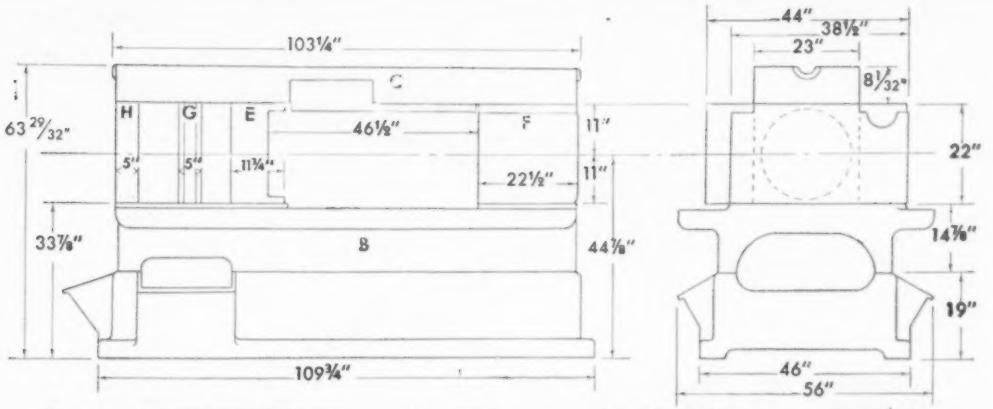

H, G, E — HEADSTOCK SUPPORTS Weight — 1233 lbs. | **B — BASE** Weight — 6655 lbs. | **C — TOP BED** Weight — 1232 lbs. | **F — GEAR BOX** Weight — 841 lbs.

BE VALUE WISE OR OTHERWISE

True of any "means goods," the purchase price of any Multiple Spindle Bar Automatic is only relative. It is "high" or "low" on the basis of the total cost of its total services, compared to other brands. Important items of total cost are those of operation and maintenance.

Machine analysis will invariably disclose the low cost operation and maintenance features that have been "built into" a machine. Such features are built into the CONOMATIC, beginning with its very foundation. The figures above substantiate the claims below.

THE 1½" Six Spindle MACHINE FRAME:

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   The Frame provides a LONGER TOOLING AREA, with more positions and accommodations for tooling and attachment applications, with more clearance and conveniences for faster tool setting, than are provided by any other "automatic."
2. **Provides better support to work and tools.**
   The Frame provides better support and alignment to headstock members, tool slides, and other units and mechanisms, with BASE SUPPORT CLOSER TO THE WORK AXIS, with BETTER TOP BED SUPPORT TO SHORTER, "WEAVE PROOF," UPRIGHTS, and, with larger, heavier, and stronger, Top Bed and Base, than are provided by any other "automatic."
3. **Provides greater accessibility for lower cost operation and maintenance.**
   The Frame provides a more orderly arrangement of, and easier access to, all units, mechanisms, parts, and adjustments, than can possibly be provided by any "automatic" that does not have a VISIBLY ACCESSIBLE, NON-INTERFERING CAM SYSTEM.

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IF YOUR DRILLING COSTS ARE LIKE THIS

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FOSDICK *Sensitive* RADIAL

Because of its unique design which combines sensitive drilling and the flexibility of radial construction in one machine, the FOSDICK Sensitive RADIAL is proving to be a cost-cutting machine tool for hundreds of economy-minded production men throughout America.

Here are some of the features found only on the FOSDICK Sensitive RADIAL that makes it America's favorite . . . elevating table adjustable on sturdy one piece column puts work in proper location in relation to the spindle at all times . . . Both the arm and the table swing in a 360° arc . . . the arm at fixed height is easily reached from operator's normal position . . . head provides nine speeds and four feeds . . . Control levers for both feeds and speeds are direct reading and right at the operator's fingertips.

For complete information on this new, versatile machine write for FOSDICK Sensitive RADIAL Bulletin SRA.

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Machine Screw
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Cost No More ... Assure Standardized Accuracy

Card's extreme care in maintaining utmost accuracy is a *plus* that lifts Card Certified* Taps away above the ordinary. Costing no more than run-of-the-mill taps, they're your best possible buy for dependability and long, economical use.

Card Machine Screw Taps are available in both carbon steel cut thread and high speed steel cut thread or ground thread.

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ONE PIECE MOUNTING—Bushing and sheave go on together. Alignment is easy. Sheave is on right first time.

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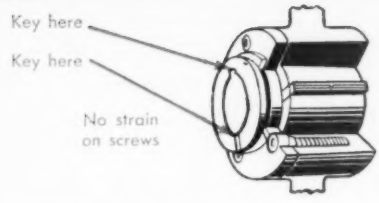
Greatest Name in V-Belt Drives

This... Not This!

FULL CIRCLE GRIP — Bushing split full length. Collar is separate. Shaft gripped full length around full diameter.



POSITIVE DRIVE — Bushing is keyed to both shaft and sheave. No slipping. No sheared screws. No jammed bushings.

USE FAST-MOUNTING Magic-Grip SHEAVES

Full Grip...No Slip!

MAGIC-GRIP SHEAVE is the fastest mounting sheave you can buy. And you can demount it just as fast. It runs true, will not slip or jam. It always comes off easily without hammering, forcing, or distortion.

Best of all it costs no more than an ordinary sheave. Even if you don't change sheaves often, you should have *Magic-Grip* sheaves on every drive to eliminate the possibility of shaft and bearing damage when ordinary sheaves are hammered or pried on or off. Sizes 1 to 250 hp.

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You can get everything you need for your V-belt drives from one reliable source. Allis-Chalmers offers the broadest line of V-belts, speed changers, and standard and variable speed sheaves in the industry. And you get the extra engineering skill that comes from having more industrial V-belts, installations than any other manufacturer.

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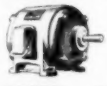


MOTORS — ½ to 25,000 hp and up. All types.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

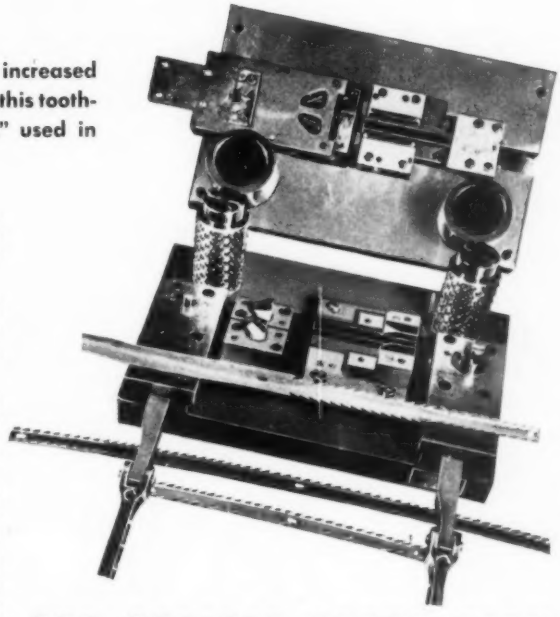
PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Texrope and *Magic-Grip* are Allis-Chalmers trademarks.

ALLIS-CHALMERS A-C

Die life *increased 66 times* with Carboloy dies!

Carboloy blanking dies paid off in increased die life, reduced maintenance time on this tooth-punching operation for "saw bands" used in cotton-cleaning machines.



HERE'S THE record of a Texas manufacturer who changed from steel dies to dies of Carboloy Cemented Carbide for blanking .030" cold-rolled C-1040 steel:

Increased die life 66 times! Total life of steel dies was 1,500,000 blanks. Life of Carboloy Cemented Carbide dies is estimated to be 100,000,000 blanks!

Cut maintenance time more than 30 hours per machine per year. Steel dies had to be sharpened once a day during rush season, requiring 15 minutes per die change. Carboloy Cemented Carbide dies performed 20,000,000 hits—a normal full year's operation—before sharpening was necessary!

Carboloy Cemented Carbide dies solved the production headaches of this manufacturer once and for all by stepping up production, cutting costs, improving finishes and reducing down-time and rejects. Thousands of manufacturers are putting their production on a more profitable basis with Carboloy Cemented Carbides.

Chances are you could enjoy such benefits in your blanking, forming or cupping operation. Your local Carboloy representative will be glad to answer any questions and to refer you to Carboloy users in your area. Or, send us the coupon today.

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You bet I'm interested in results like these! Send me Die Engineering Manual D-124 today.

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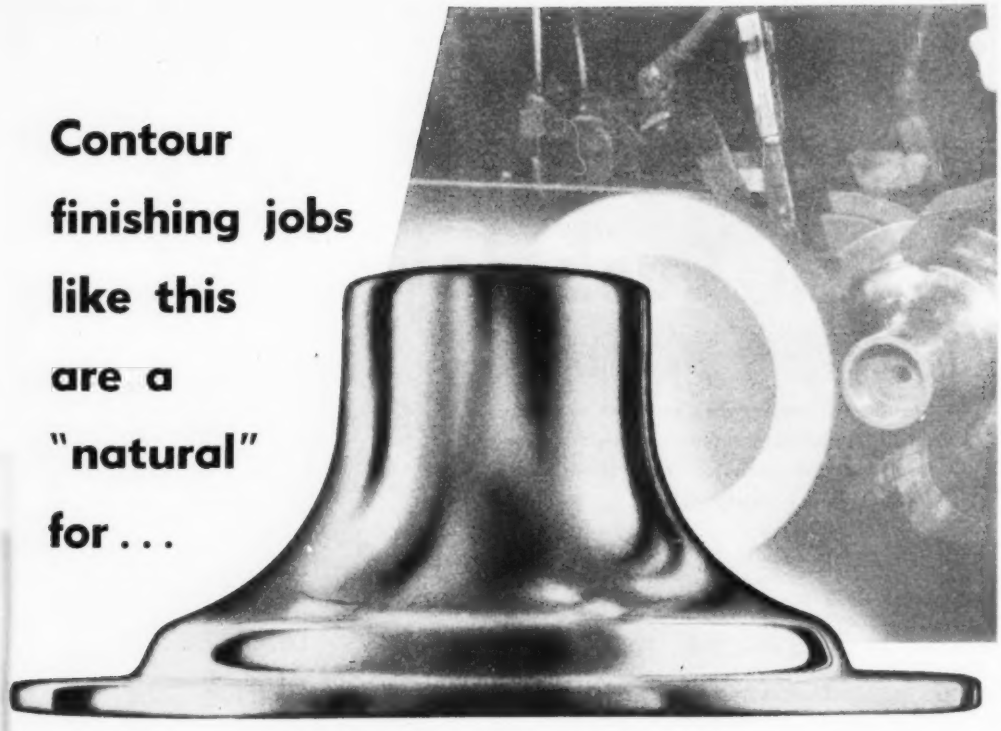
Contour finishing jobs like this are a "natural" for . . .



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Cloth Belts

The right combination of contact wheel and belt can work wonders in production, particularly on contour finishing, getting a beautiful pre-plating finish, doing it quickly, and generally eliminating buffing.

Every grain in a LIGHTNING METALITE Belt is uniformly electro-coated, and is doubly anchored and DURABONDED® in place. No wild grains to scratch the finish and lengthen the job. No blending marks nor holidays. Just a clean job of finishing like that shown in the unretouched photo above.

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"Proving Ground for Production" and keep in step with latest methods of finishing. Write to Dept. AM-1, Behr-Manning, Troy, N. Y.

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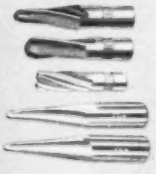
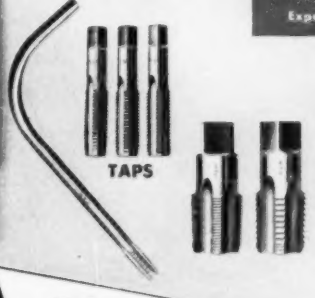


MILLING CUTTERS

DIES



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CUTTING TOOLS
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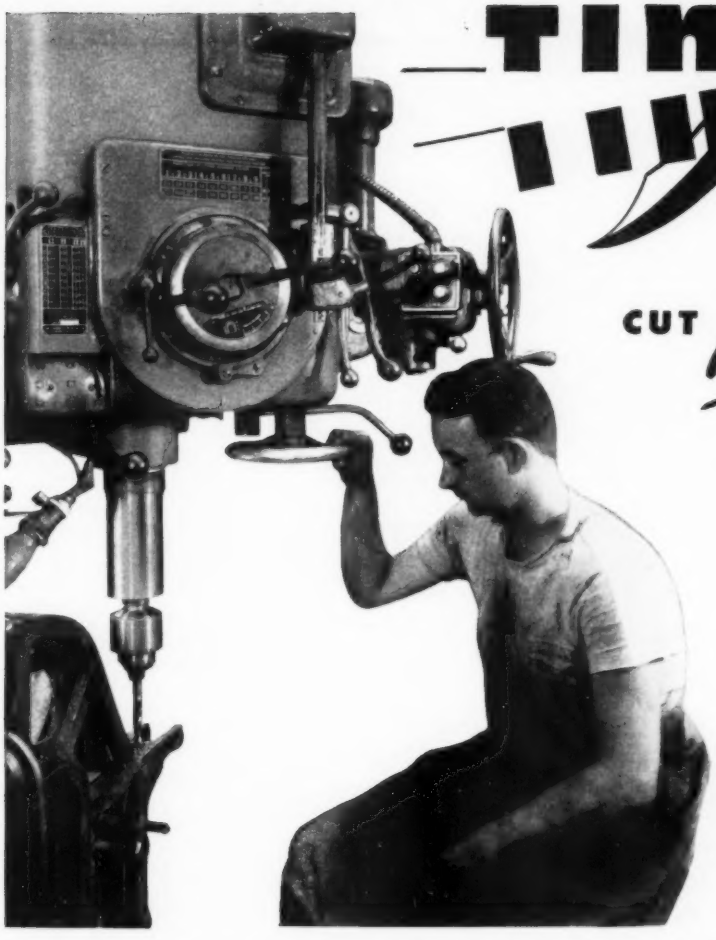
TIME CUT *in half!*



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RADIAL AND UPRIGHT DRILLING MACHINES
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Radials 7⅜" dia. col., 2½" arm, to 26" dia. col., 12' arm.
General purpose Uprights, 21" to 28" sizes.
Production Uprights, 21" to 28" Jig Borers, Portable Horizontals, Spacing Table Machines.

Write for Bulletin R-29

"Cincinnati Bickford Super Service Radial Drills are the fastest and most efficient for our work."

We quote the Package Machinery Company of Springfield, Massachusetts — and again, "The job is very intricate: 32 holes accurately laid out are drilled and reamed, two at a time; depth, 6 inches. Tapping to 1¼ inches is done singly."

Actual cutting time one-half that of previous machines used. The controls are very handy, and the machine is dependable for accuracy.

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Wickman Steel-Bonded Diamond Wheels

practically indestructible with extra long life. Diamond particles stay in place until completely worn. Finish tools better for longer tool life.

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Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Toolometer

Will you please advise where we may obtain further details on "toolometer" controls, mentioned in the tooling article, Page 113, *AM* Nov. 13.

S. J. Gwoosh
President
Excel Automatic Products, Inc.
Newark, N. J.

"Toolometer" controls are incorporated in the automatic machinery designed by The Cross Company, 2350 Bellevue Ave., Detroit 7, Mich. Ralph E. Cross is executive vice-president.

Flame Straightening

We are interested in the flame straightening of round steel bars and structural shapes . . .

W. Wallace McKaig
Cumberland Steel Company
Cumberland, Md.

The theory here is to apply heat at the bulge and on the convex side rather than the concave. Heating at this point makes the metal plastic, and the colder metal in the inner side of the bend will then exert enough force on the plastic metal to upset it slightly.

In one case, we straightened printing rolls, warped in service, by placing them in a lathe and rotating them slowly while applying heat, retracting the center as necessary as the piece straightened out. This, of course, was a case of strain put in by service pressure, so it could be relieved simply by heating the roll until it resumed concentricity—Ed.

Relative Machinability

I have noticed in your Oct. 2 *AM*, p125 and 127, the "Structures and Machinability of Carbon Steels and of Alloyed Steels". I would like very much to have two copies of these Reference Book Sheets, as our copy of *AM* is a departmental copy and I cannot obtain tear sheets from it. The main reason for my wanting the copies is that these Reference Book Sheets show, for the first time as far as I can determine, the relative machinability of cold-drawn and the normalized or annealed material. Previous published data have always given the wrong interpretation to the machinability rating and have generally represented the cold-drawn material as having a superior machinability rating. These sheets also show the representative surface finish and the correct rake angle for each steel. I am glad to see your reference book sheets contain such reliable information.

S. W. Gilbert
Associate Professor
Dept. Metal Processing
University of Michigan

Lapping Developments

I have read your Oct. 2, 1950 Special Report, "How to Lap" with considerable interest, and after a careful study of it, feel that it fails to review adequately the lapping developments of the past five years. Developments such as the Lapmaster were either glossed over hurriedly, or else statements made about them were inaccurate.

The Lapmaster principle of operation embodies a special-alloy cast-iron lap plate, conditioning rings which automatically condition the plate during the lapping cycle, and a continuous automatic flow of lapping compound suspended in proper vehicles. It, therefore, constitutes one of the machines referred to as "single-lap" throughout the article.

Specific references will help clear up my point. First of all, it is said that machines using loose abrasives on cast-iron laps give excellent results on hardened steel, but not on cast iron, soft steels, and non-ferrous metals. This is a direct contradiction to results consistently achieved on the Lapmaster. It not only readily laps the materials mentioned above—but it gives top re-

FOR A **FUNCTIONAL** SURFACE FINISH

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a. **CONTROLLED SURFACE ROUGHNESS**
Any desired surface roughness duplicated in every part

b. **NO WAVINESS OR SURFACE IRREGULARITIES**
A true geometrically-accurate surface with no high spots to break the lubricating film and cause high localized heat

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The cross-hatch pattern characteristics of the MICROHONING process is unlike that of any other machining operation. It is free of fragmented, torn or smear metal that will wear or flake off under load.

* SURFACE-FINISH SYMBOLS recommended by SAE Surface Finish Committee and its sponsor the American Standards Association.

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BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS.

even tempered, but TOUGH!

HY-TEN "B" No. 3X

If you need even temper and toughness on heavy-duty parts, by all means investigate the unusual properties of HY-TEN "B" No. 3X!

WL can supply "B" No. 3X in bars, discs, flats or forgings heat treated to your exact hardness specifications. And this unusual HY-TEN alloy steel can be machined even when hardened as high as 477 Brinell (48 Rockwell "C")!

This unusual property—*machinability at high degrees of hardness*—makes this steel particularly well suited for parts which are apt to distort badly in the treating operation. This makes possible savings in handling and set-up time and finishing operations by putting parts into service without further treatment. A smoother finish is obtainable at almost any degree of heat-treated hardness than is possible with standard alloy steels.

WL *steels are metallurgically constant. This guarantees uniformity of chemistry, grain size, hardenability—thus eliminating costly changes in heat treating specifications.*

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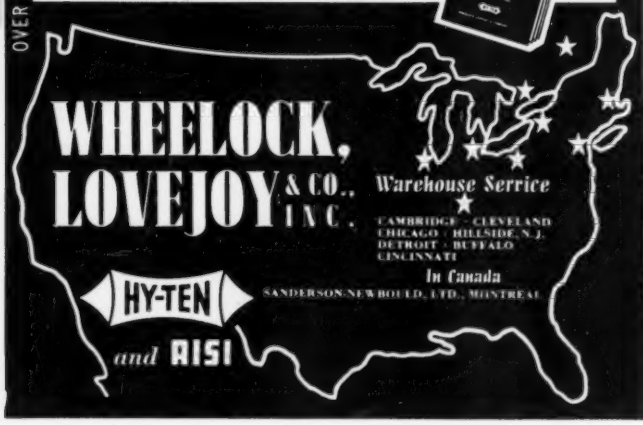


sults on such materials as quartz, carbon, aluminum, bronze, brass, plastics, etc.

The next statement with which I would contend is that pieces requiring parallelity of lapped surfaces must be run on a double lap machine. We have found that parallelity can be produced on the single-lap Lapmaster. Many manufacturers are using this machine for parallel lapping and are very pleased with the results.

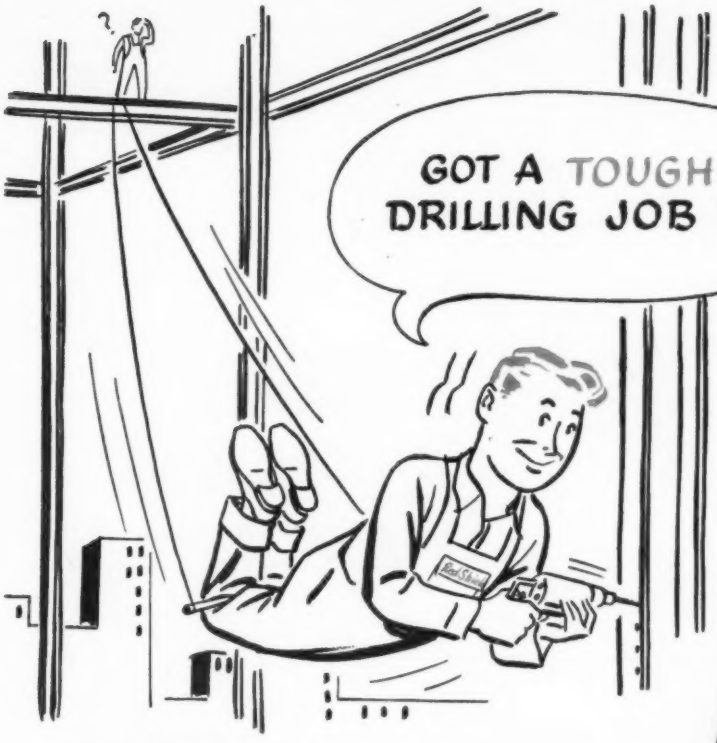
In the discussion on cylindrical lapping, it is pointed out that only double-lap machines can be used to lap cylindrical parts. This is not true today, because the Lapmaster can readily lap cylindrical or conical pieces by means of a relatively simple single-lap setup.

Two-lap machines having abrasive laps are described as having a lapping cycle about one third as long as that of machines using loose abrasives. They are also said to be much more versatile than those with cast-iron laps in ability to handle various sizes and materials. Yet, consistent results have shown us that the Lapmaster, using loose abrasives, will produce parts to an equivalent RMS and flatness just as fast, or faster, and (as noted before) it does an excellent job on both soft and hard materials, metallic or non-metallic.

My biggest point of contention with the article falls in the discussion on single-lap machines. The statements made therein indicate a cursory and incomplete investigation of the latest developments in this field. It infers that lapping machines using the conditioning-ring principle (that of the Lapmaster) are satisfactory only for small pieces. The actual situation is that large-model Lapmasters will handle not only small parts, but will lap larger and heavier parts than will any other lapping machine now being offered commercially.

There was much valuable information contained in this article. However, I feel it unfortunate that this new development was not covered in more detail.

Richard J. Brown
Mechanical Engineer
Crane Packing Company
Chicago, Ill.



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CHANCES are your drilling problems are more down to earth than the one Red Shield is tackling here. But no matter what you have to drill—iron, steel, brass, copper, aluminum, plastic—there is a Red Shield Brand Drill that will give you the best work at the lowest cost.

That's because these drills—like all Shield Brand Tools—are Foremost Quality in design, construction, and workmanship. You can rely on them for uniform operating characteristics and fast, uninterrupted production.

Industrial Supply Distributors coast to coast stock and supply Standard Red Shield Tools. If you have a problem, call a Standard Service Man. He brings you the benefit of our 69 years' experience in solving tough metal cutting problems. There's no cost or obligation, of course.

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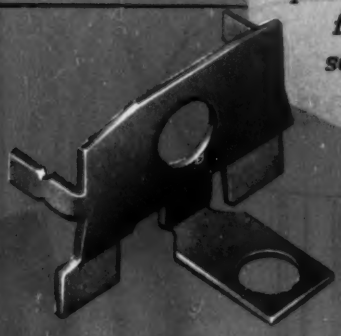
16 different parts stamped from the same die!

Production required 16 different condensor stator supports—all like the one shown here but with center tongues of varying lengths. Ingenious die construction with an indexing punch made one die do the work of 16. Tooling costs were held to a minimum, but the one die that did the job became just 16 times as vital in meeting schedules. That's why . . .



they built the die in a DANLY PRECISION DIE SET

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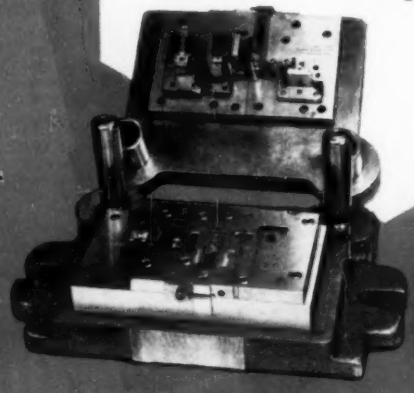

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SPOT NEWS of Metalworking

- **Curtiss-Wright has made rapid progress in developing its program** for producing the British Sapphire jet engine in this country. It will be ready soon to place machine tool orders, which may run to a total of $100 million.

- **General Motors will build Republic F-84 Thunderjet fighter planes** in its Buick-Olds-Pontiac assembly plant at Kansas City, which is government-owned but under lease to GM. Tooling will begin immediately and assembly of cars will continue until airplane manufacture starts. Large amounts of conveyorizing equipment will be needed. GM produced Grumman planes in its B-O-P plant at Linden, N. J., during World War II.

- **Steel from Europe was shipped recently to the Chicago area by boat** up the St. Lawrence and through the Great Lakes direct to Chicago docks. Winter now prevents the lake haul.

- **Svenska Kugellager Fabriken of Holland will establish a ball bearing factory** at Veenendaal in province of Utrecht. Production will be primarily for export.

- **Revolutionary automobile ignition has been invented** in Holland. Wytze Beye Smits is inventor. It will be made by new concern, "Smitsvonk," at Ryswyk near The Hague. System is based on low-tension ignition and new kind of spark plug. Representatives of U.S. automobile companies are reported to be interested in licenses.

Heavy cutbacks are expected in flat-rolled steel shipments to customers starting in February. Size of slash will vary widely, being dependent upon end product and customer. Drop will be as much as 35% compared with last October's quota, in some instances.

- **Large amount of polished chrome stainless steel moldings and trim** will be used this year by one automobile maker. At present a "flash chrome" plate is used to give lustre. If chrome is out, stainless will be given a special polish, but cost will go up. Quality will not be affected unless it eventually becomes necessary to go to paint as in last war.

- **First European machine tool exposition will be held in Paris September 1-10** with about 500 machine tool builders participating from Germany, Benelux, France, Italy and Sweden. Exposition was organized by European Cooperation Committee of Machine Tool Industries. The British association declined to join. Headquarters are at 2bis, Rue de la Baume, Paris 8e. B. Gardair is general commissionaire of the exposition.

- **Douglas Aircraft has resumed on-the-job training of workers.** Program consists of a four-weeks' course which takes young men out of high school machine shops and makes milling machine operators out of them.

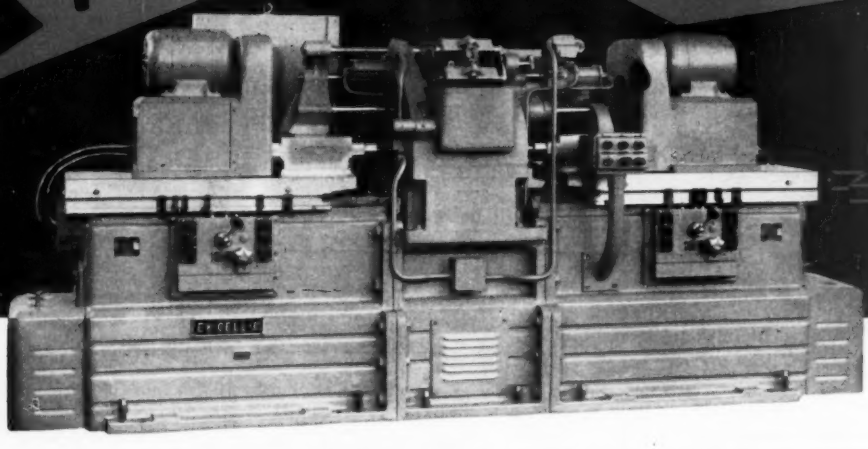
---

34 Cleveland metal fabricators have agreed to wage increases of 12-16 cents an hour with United Steel Workers' locals. Fourteen other companies will follow suit. Six others with cost-of-living clauses will increase wages 2-3 cents an hour.

- **New England integrated steel mill to be built at New London, Conn.,** is likely to get Washington's approval for rapid amortization. Hope is that financing then will be done privately. If it isn't, count on a federal loan. New England Steel Development Corp. has asked authority to erect mill, which will have 1 million tons annual capacity.

- **Thirty-two defense plant projects totaling $544 million** have been granted certificates of necessity by NSRB. U.S. Steel heads list with $398 million for its Morrisville, Pa., steel mill. Others: Chrysler Corp. $15.9 million; Carboloy Co., Inc. $2.5 million; Thompson Products, Inc., $4.9 million; Wheeling Steel $8.7 million; Allegheny-Ludlum Steel $5.2 million; Roller Bearing Co. of America $1.5 million; New York Air Brake $748,870; Jones & Laughlin Steel $2 million; Dresser Industries, Inc., $663,070.

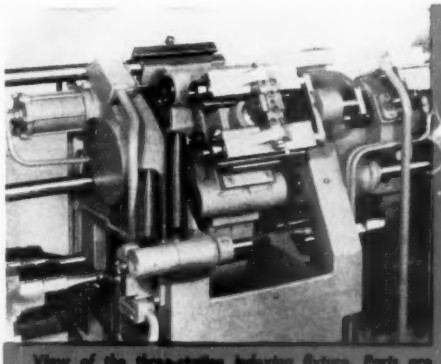
DOUBLE ACTION FOR DOUBLE PRODUCTION



EX-CELL-O TWO-WAY MACHINE BORES, CHAMFERS, AND FACES BOTH ENDS OF TUBULAR STEEL PARTS AT NET RATE OF 366 PIECES PER HOUR!

Ex-Cell-O Way Type Precision Boring Machines save time by machining parts from two or more directions at the same time. And relationship of the various operations to one another is exact because the accuracy is built into the machine—it does not depend on the accuracy of repeated locating and clamping.

The machine illustrated here has a trunnion type indexing fixture, machines both ends of two parts per cycle, ejects the finished work automatically. Have your Ex-Cell-O representative explain all the advantages of these machines to you, or write today to Ex-Cell-O in Detroit for further information.



View of the three-station indexing fixture. Parts are loaded in upper station, machined in lower station, automatically unclamped and ejected from rear station.

EX-CELL-O CORPORATION DETROIT 32 MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • ALLIED EQUIPMENT

Washington

A feeling of permanency begins to show up in planning. The two extremes of mobilization—the "all-outers" and the "go-slowers"—have compromised their differences, and top-level, long-range decisions are finally being made.

• • •

The appointment of GE's C. E. Wilson as the nation's top mobilization chief means an end to interdepartmental bickering and bids for power.

No one doubts that Wilson is boss. This wasn't true when NSRB Chairman Symington was running things.

It also means a minimizing of Symington's influence on both control and the military build-up itself.

• • •

Symington was the administration's strongest advocate of all-out preparation for war—10-million men under arms, a 100-group air force, total cutbacks in civilian production.

The Joint Chief of Staff argued for the same thing. Now the basic decision has been made. Until D-day is set, maintenance of a broad, healthy industrial base for all-out build-up is more important than a large, and stagnant army; a large, and obsolescing stockpile of weapons.

• • •

Moneywise, the ideas that prevail in the Pentagon are the same ones that ruled before the Chinese Communists committed their full force to Korea.

The build-up will still be steady and only to a rate that can be maintained for an indefinite period. Even the Joint Chiefs of Staff agree in principle with this concept.

The only difference is in the level to which we'll build. Instead of the $35-billion-a-year for defense talked earlier, the final rate will be closer to $45-to-$50-billion. And, the initial build-up may be a little more rapid.

The President is confident that with continued economic expansion throughout the free world, this can be accomplished without serious permanent damage to the western allies.

• • •

Secretary Marshall's military procurement directive is important. It calls for spreading contracts through as many different companies as possible. It's an essential ingredient in creating war-production know-how in the broadest segment of American industry.

The military figures it will be easier (and faster) to expand the production of a dozen producers than it would be to expand the same production of, say, two or three plants.

It was a big factor in the decision to get General Motors Corp. into jet aircraft production.

This isn't M-day, but the Marshall directive instructs Army, Navy, and Air Force procurement officers to buy as much as possible in accordance with Industrial Mobilization Program production schedules.

• • •

These schedules, already negotiated with more than 10,000 plants, allocate specified percentages of plant production-line capacity to each of the three services.

To industry it means that many companies now doing business with the military without regard to M-day plans will be asked to shift their production patterns to fit.

And, many companies not doing any defense work, but "mobilized" for that purpose in case of war, will be asked to take defense orders now.

If asking doesn't work, the Government has the power to force them to do it.

• • •

This informal activation of the M-day Industrial Mobilization Program is only a prelude to a Controlled Materials Plan, and complete scheduling of all production, both civilian and military.

CMP is expected by next June at the latest. Wilson is only waiting until he gathers a staff before moving to more complete controls.

• • •

Any wage ceilings imposed along with price ceilings will be allowed to go up with the cost of living.

GMC escalator principle—automatic adjustments to correspond with changes in the cost-of-living index—will be extended to cover all workers.

Washington will throw its main efforts into holding the line of prices.

• • •

Armed isolationism is about to make its strongest attempt at a comeback since the war. Congressional debate of the subject "Can western Europe be defended?" will be long and bitter.

The administration fears the effects of the debate both here and abroad. It's more afraid the result will be the kind of compromise program that's failing in Asia.

• • •

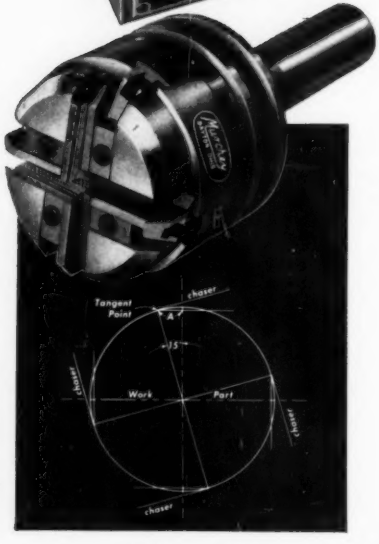
The Defense Production Board for the North Atlantic area agreed on at last month's Brussels meeting of the 12 North Atlantic Pact nations will decide on:

Types of weapons to be produced in Europe; production targets; who will produce how much of what; how best to break production bottlenecks; ways of avoiding shortages before they occur.

The Board will play a major roll in the "economic support for rearmament" program that takes the place of ECA, due to end this June.

NO CHASER-WASTING REGRINDS WITH THIS MURCHEY TEAM

Simply "clean up" your chasers as required, and RESET to cutting position instead of REGRINDING



This Murchey Micrometer Setting Fixture assures each chaser being set accurately in its holding block, precisely positioned to the ideal cutting point. Then, when the blocks are placed in the Murchey Tangent Die Head, each chaser bears an equal amount of the cutting load. No cutting edge works harder or wears faster than another.

This Fixture will handle both right and left hand holding blocks for all Murchey Tangent Chaser Die Heads.

ADVANTAGES

Murchey threads are accurate and uniform.

More threads can be cut between chaser adjustments.

Wear is equal on all chasers.

Chasers in Murchey Tangent Die Heads outlast others many times.

Ask for the full Murchey "Chaser-Saver" story.

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MURCHEY

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Lower cost per thread . . .

WITH MURCHEY TOOLS

Use Murchey collapsible taps, self-opening die heads (tangent and radial chaser types) and special threading tools

Detroit

There are and will be many effects of Washington's order on car manufacturers to continue their Dec. 1 prices unchanged. Here are some:

Productionwise: Output will drop. Companies are moving energetically to cut out all overtime operations. High-level output of 1950 was made possible solely by extensive extra hours in bottleneck departments, and elimination of these hours alone may have a startling effect on manufacturing rates. One major producer is telling suppliers volume may drop as much as 60% from earlier plans.

Planningwise: While government policy is as arbitrary as it seems to be—from the automotive standpoint, anyway—companies will hold back on forward planning and releases for tooling.

Pressurewise: Car makers are turning all possible heat on suppliers for lower prices. This is what Washington wants.

Specificationwise: Changes are being actively made on specifications, more so than is customary. Reason: To hold down or reduce manufacturing costs. It might be hypothesized that automotive quality will go down a subtle notch or two.

Saleswise: Fewer cars will tend to stimulate demand in the field. That means wider dealer profits through underallowance on used car trades.

Engineeringwise: If the crisis—as distinguished from actual war — continues past spring, look for speedup of work on entire new lines of cars. Why new lines? So the price strictures can be voided. Why spring? Detroit expects that if an international climax comes, it will come then. If one doesn't appear, the big push will be started for 1952 models.

• • •

For the record, here are initial 1950 auto statistics:

(1) U. S. production: Cars, 6,672,000 trucks, 1,343,-050; total, 8,015,750—highest on record, 28% above the previous record year, valued at $10-billion, U.S. and Canadian combined: Cars, 6,950,000; trucks, 1,450,000; total, 8,400,000.

(2) Domestic sales: Indicated at 7,500,000 or more.

(3) Total registrations: 43,488,591 as of July 1 (R. L. Polk figures). Estimated 48,484,000 at Dec. 31, 1950.

(4) Replacement parts production: $2-billion at wholesale—highest on record.

Apt indication of the confused outlook on 1951 production was furnished by annual Automobile Mfrs. Assn. luncheon of automobile editors. Predictions for 1951 ranged from 2,777,777 civilian assemblies of cars and trucks in United States up to 6,707,000. Average: 4,303,000. Guesses for passenger cars alone ran from 2,000,000 to 5,800,000; on civilian trucks from 450,000 to 1,600,000.

• • •

The Chrysler tank project, scheduled for Newark, Del., may be a little larger than Cadillac's at Cleveland. Value is $160 million. Tooling will largely be from the ground up. Of similar giant size is GMC truck order, for $100 million —plenty of tooling here also.

Elsewhere in the military area: Ternstedt Div. of General Motors has a contract for fire control instruments which will require close to 2000 employees. Locale and other details were not immediately revealed. Kaiser-Frazer Corp. is talking aircraft manufacture with the Air Force; job will be done at Willow Run. The company insists it would continue to make automobiles as long as possible—that aircraft production will not require entire Willow Run plant.

Chrysler's tank order came shortly after the company tipped its hand on full planning for its new V-8 engine. A new plant will be built at Trenton, Mich., to broaden output for 1952 lines. Employment: 3000. Start of operations: late 1951. Tooling: largely released already.

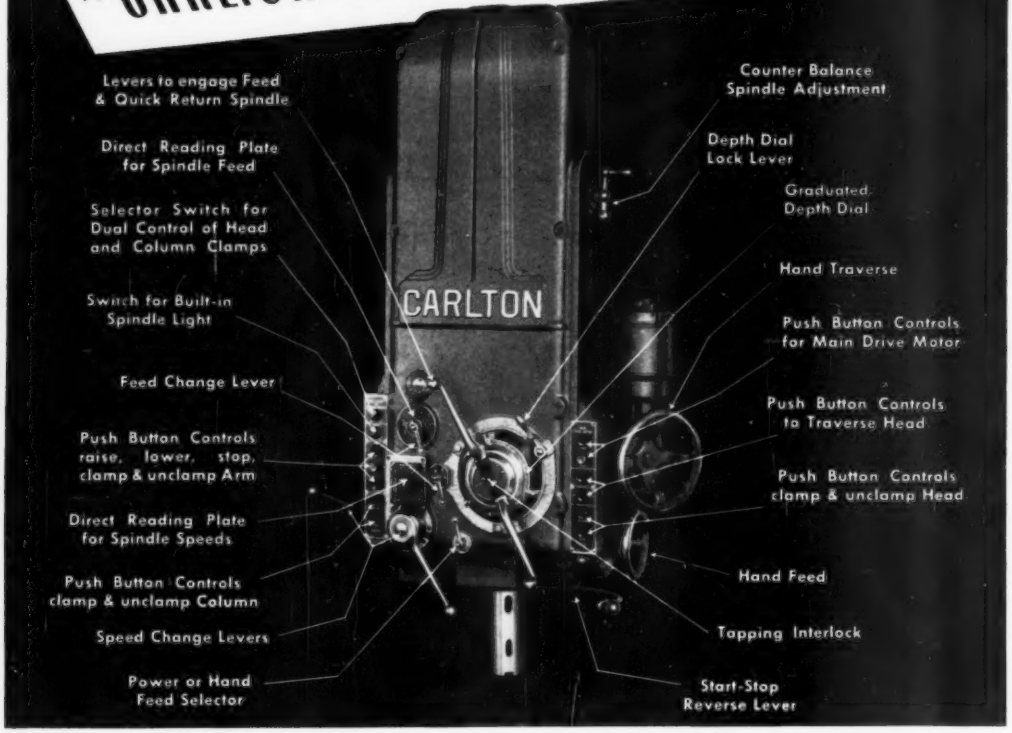
• • •

Ready for the future: GM designers and engineers are overlooking no bets on tomorrow. Proof lies in "Le Sabre"—experimental, futuristic car now being built in Styling Section shops. In about two months, an actual model will be rolling over roads. What it will look like, the mechanical details, and operational features were revealed in a mock-up.

Aircraft influence is prominent in Le Sabre's long, low lines, fin-type rear fenders, jet-cone in center rear, cockpit boasting as many dials and gages as a bomber. Dimensions: Length, 200 in.; wheelbase, 115 in.; width, 76½ in.; height at cowling, 36½ in.

GM's "LE SABRE" (left) shown with designer Harley Earl's experimental car of 1938. Le Sabre's is powered by 300-hp engine. Dual fuel system injects methyl alcohol with premium gasolines. Compression is 10:1. Brakes set on either side differential housing are of 9-in. dia to match 13-in. wheels. Weight of 3000-lb stems from use of magnesium and aluminum

★CARLTON Centralized Controls


Levers to engage Feed & Quick Return Spindle
Direct Reading Plate for Spindle Feed
Selector Switch for Dual Control of Head and Column Clamps
Switch for Built-in Spindle Light
Feed Change Lever
Push Button Controls raise, lower, stop, clamp & unclamp Arm
Direct Reading Plate for Spindle Speeds
Push Button Controls clamp & unclamp Column
Speed Change Levers
Power or Hand Feed Selector
CARLTON
Counter Balance Spindle Adjustment
Depth Dial Lock Lever
Graduated Depth Dial
Hand Traverse
Push Button Controls for Main Drive Motor
Push Button Controls to Traverse Head
Push Button Controls clamp & unclamp Head
Hand Feed
Tapping Interlock
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MECHANICAL ADVANTAGES

Ground teeth, hardened gears with wide faces.

Hardened spindle.

Ball and roller bearings.

Column clamp mounted in Arm.

All parts, wherever possible, are machined from drop and hammered forgings.

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Every part is jig machined to guarantee absolute interchangeability of parts.

Entire machine is assembled on the unit principle.

Only one friction clutch unit to adjust.

Simple electric circuits to all motors.

Easier to keep clean.

OPERATION ADVANTAGES

Dual clamping to Head and Column. Automatic clamping for Arm to Column.

Pushbutton operated Arm elevating control.

Automatic lubrication to column with column cleaned by wipers from top to bottom.

2 levers control 36 spindle speeds from Head.

Direct reading and indicating speed and feed chart.

Electric light built in Head near spindle.

Adjustable counterbalancing spring operating with standard geared-to-spindle counterweight.

Positive feed clutch with serrated teeth.

THE CARLTON MACHINE TOOL CO.

THE CARLTON MACHINE TOOL CO., CINCINNATI 25, OHIO, U. S. A.

Machine Tools

Pattern of machine tool orders is reminiscent of the early days of World War II. British and French flooded U.S. machine tool builders with business from September, 1939, well into 1940. They helped the machine tool industry in this country to get going.

First phase of a huge British machine tool buying program for defense production is now ending. U.S. builders have on their books some $125 million of British orders. Second phase, which calls for an undisclosed volume of U.S. tools, will begin soon.

• • •

British are out to expand jet engine production sharply. De Havilland, Rolls-Royce and Armstrong-Siddeley are reported to be the manufacturers involved. Britain's current rearmament program will cost 4.3 billion pounds (over $12 billion). That is a staggering expenditure for the British.

• • •

British government, represented by Ministry of Supply, is to own all machines bought for new armament program. It will lease them to factories and will have right to move them from one plant to another.

Ministry of Supply has asked British machinery builders to freeze their export orders until government can determine how many machines destined for foreign users can be put to work on the rearmament program at home.

• • •

Orders from Britain on books of U.S. builders are "float" orders, equivalent to pool orders. British thought it best not to wait to place orders until they knew exactly what they wanted in each specific plant.

British government is getting machines from whatever sources it can, both at home and abroad. Western German machine tool builders are faring well as a result; they probably will receive orders for many big machines. Swiss builders also are getting some British business.

No one knows what the ultimate size of the British buying program in this country will be. Its enormity is indicated by the fact that around 2000 turning machines alone are being secured here. Second buying phase may duplicate first in dollar volume.

• • •

Amount of money spent by French for U.S. tools thus far (probably $1 million) is a piddling sum compared with what is to come. French may well contract for as much as $100 million of machines in this country.

Most U.S. machine tools ordered by French government will go into private French plants, which will pay the government for them. Fact is that government will get them free from U.S. through "Mutual-Aid" pact. Thus sum paid by French manufacturers to their own government will be sheer profit.

• • •

The Netherlands are said to be committed to same kind of procedure as the French in acquiring U.S. machines. Dutch manufacturers will pay their government a purchase price for the machines. But government will receive the machines free from U.S.

• • •

Curtiss-Wright is reported making rapid progress in engineering work on British Sapphire jet engine to get it ready for U.S. production. Time when machine tools will be ordered is not too far off.

It is possible that up to $100 million will be spent for machine tools and other production equipment in tooling for the Sapphire job.

• • •

Members of Machine Tool Advisory Committee to NPA met in Washington on December 28 at request of Machinery Division. Machine tool industry seems no nearer getting priorities for materials and component parts than it was a month ago.

• • •

One billion dollars is best estimate of amount of machine tools required for entire rearmament program. That sum includes machines for European mutual aid. But total is only a guess and is subject to upward revision.

• • •

There are some people in high places in Washington who are not convinced that the tooling job for rearmament will be as large as indicated. They are not ready, therefore, to throw their weight behind movement to get preferential treatment on materials and manpower for the machine tool industry.

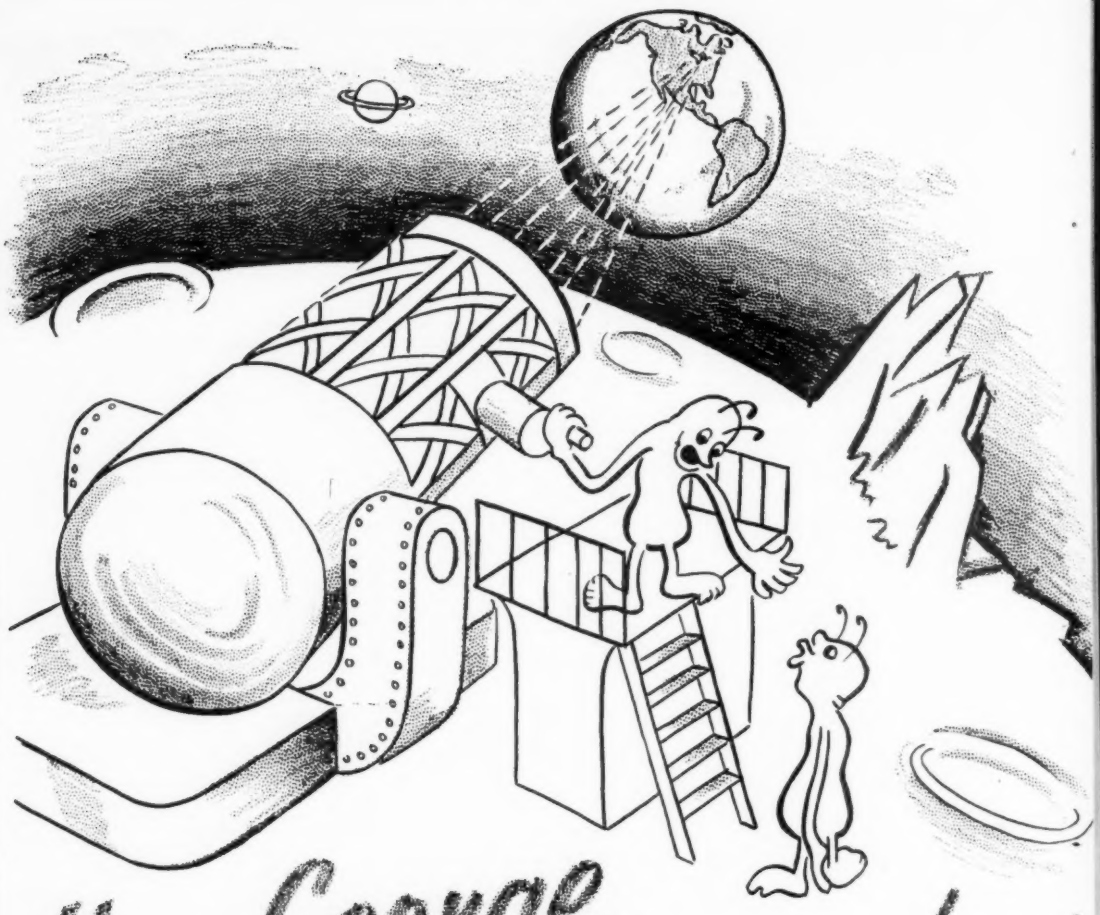
• • •

James Blackshaw, Under-Secretary in charge of British Ministry of Supply, is said to be due in this country in early spring in connection with British machine tool buying program.

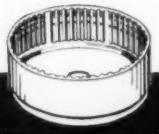
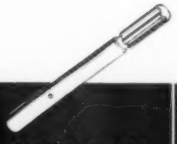
New orders for machine tools show up at 292.7 on index of National Machine Tool Builders' Association. That is not far from year's peak of 305.1 in August. October stood at 289.6.

Shipments of machine tools rose to 110.9 during November, as against 100.9 the previous month. December is likely to match November.

Builders continue to be plagued, however, by critical shortages of materials. Numerous times, machines are completed except for one or two items which hold up deliveries for days or weeks. Many companies are running 48 hours, and some are up to 55 hours.



Hey, George, look what they're

Type of part	7-pitch, 33-tooth, ⅞" face width gear	 5½" internal gear	7" P.D., 6-pitch gears	 ¾" OD straight spline shaft	
Production time	One Shear-Speed in 6½ hours handles production of 14 other machines in 8 hrs. ea.	30 seconds each	49 seconds each	24 seconds each	

**The Shear-Speed is also a highly versatile machine. Some producers use a single machine to produce, in turn, runs of a number of different gears.*

That's what the Michigan Shear-Speed gear shaper does. It accurately produces toothed parts in a fraction of the time required by other methods—by cutting ALL the teeth at the same time.

Gears, with or without shoulders, toothed clutches with or without interrupted teeth, straight splines, involute splines, sprockets, special toothed parts like eccentric cams or brake ratchets—all can be cut faster and at lower cost on the Michigan Shear-Speed.*

In the table below are a few typical examples. But—better than that—let us figure what kind of production you can get on YOUR gears.

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complete equipment from blank to finished gear

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doing now!

...they're cutting ALL the teeth *at the same time.*

1¾" face, 51-tooth gear	12 & 14 pitch interrupted tooth clutches	Eccentric (free-wheeling cam) cut to shoulder	6-pitch oil pump gear	5-pitch, 15-tooth Brake Ratchets
38 seconds each	16 seconds each	14 seconds each	69 seconds each	110 seconds per set of 4

CHASER LIFE DOUBLED

JOB DATA

Part: Packing nut
Operations: Drilling, forming, threading, cut-off
Machine: 4-spindle Acme Gridley, using high-speed tools
Metal: 420 stainless steel

. . . staining and leakage problems also solved when manufacturer* changed to TEXACO Cleartex Cutting Oil

The stainless steel used on this job is one of the toughest metals to machine. Operators reported their greatest difficulty was frequent breakage of the threading chasers, none of which lasted more than three shifts (24 hours). In addition, leakage of machine lubricant into the cutting fluid caused contamination and high oil consumption.

At the suggestion of a Texaco Lubrication Engineer, the competitive cutting fluid and machine lubricant were both replaced by *Texaco Cleartex Cutting Oil*. Chasers now last six shifts (48 hours) —*double the life!* Because *Texaco Cleartex Cutting Oil* is dual-purpose—designed to serve as both cutting fluid and machine lubricant — contamination has been completely overcome and oil consumption materially reduced.

Still another advantage gained from the change to *Texaco Cleartex Cutting Oil* is that either steel or brass can be worked without changing oils. *Texaco Cleartex Cutting Oil* does not stain.

Let a Texaco Lubrication Engineer—specializing in machining—help you gain similar cost-saving benefits in *your* plant. There is a complete line of Texaco Cutting, Grinding and Soluble Oils to assure better, faster, lower-cost machining, whatever the metal or the method of working it.

Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, New York.

*Name on request

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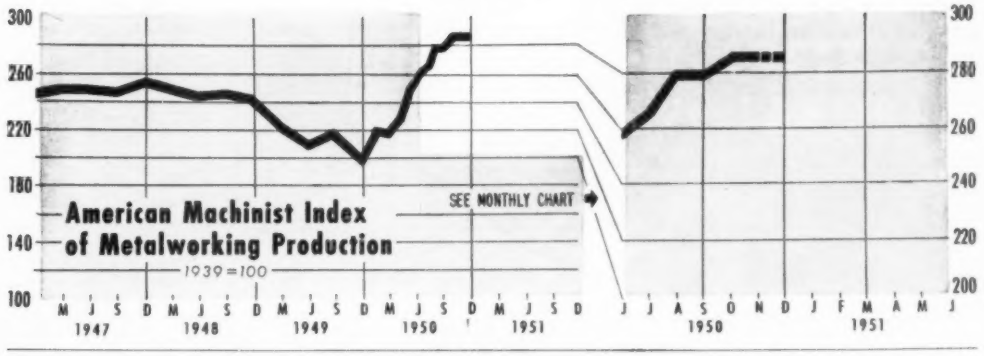
TUNE IN . . . TEXACO presents MILTON BERLE on television every Tuesday night. METROPOLITAN OPERA radio broadcasts every Saturday afternoon.

Gaging Metalworking



Armed Forces Step Up Armament Buying

Metalworking is beginning to get an impressive volume of armament business. Automobile industry is in front rank. Chrysler has huge contract for tanks, General Motors for jet planes and 3.5-in. rockets (at Oldsmobile).

Cleveland Ordnance District has placed $78 million of orders with Ohio firms. Of that sum, $63 million is for jeeps from Willys-Overland.

• • •

The wave of military buying gives warning that conversion problems already are with the metalworking industries. Washington's step-up of rearmament program means less civilian goods sooner than anticipated.

By mid-1951 defense spending is likely to move up to a $25-30 billion-a-year level. Recently it had been slashed to $20 billion.

Prospects: military production will reach a rate of $50-60 billion by end of year. That is about same rate of build-up as in World War II. It means doubling of defense spending every six months.

• • •

Just what happens to consumer metal products is not clear-cut. Output will shrink more and more as the year wears on and smaller tonnages of materials are parceled out. Now, the outlook is about like this:

Television—immediate drop of 25% is sure. By latter part of year, production will be down to 50% of last year. Chances are that output for civilian market will be completely suspended by end of 1951.

Automobiles—Studebaker will cut back 20% in cars and trucks. Others are scheduling less drastic declines immediately. First quarter assemblies may be as high as 1.6 million units, equivalent of a 6-million-a-year rate. From then on, production probably will slump. Best guess for year: maximum of 5 million cars and trucks, minimum of 3.5 million. Military needs will keep up truck output as it did in last war.

Appliances—As copper goes, so goes the appliance business. Volume for year likely to be close to 1949 total. That means drop of at least 25% or more in large appliances and 20% in small appliances. Sales of all appliances were 53.7 million units in 1950.

Housing—New "starts" are put at 850,000 this year, as against 1.3 million last year. 1951 still promises to be fourth largest home building year in history.

• • •

American Machinist index has been moving sideways for three months. It stands at 285, with 1939 as 100. It is bound to go up this year, but may lose a few points before it resumes its rise. Reason: dislocations caused by use-limitations on materials.

INDEX

	DEC. '50	NOV. '50(p)	OCT. '50(r)	NOV. '49
	285*	285	285	204
Machinery		266	261	187
Electrical Manufacturing		333	333	233
Automobiles, Trucks		258	264	176
Transportation Equipment		277	273	229
Other Metalworking		308	308	223

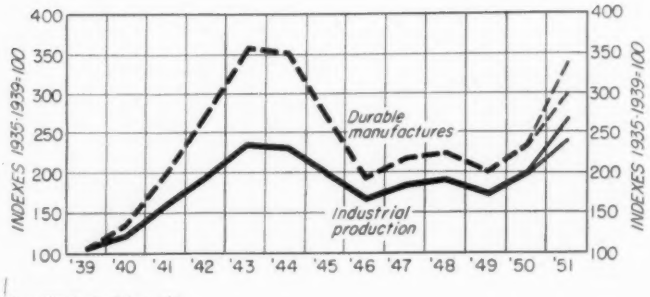
AMERICAN MACHINIST'S INDEX OF METALWORKING PRODUCTION is based on manhours worked in the five components above.

*Estimated (p) Preliminary (r) Revised

Gaging Business

Industrial Production, Durables Head for New Peaks in 1951

	Industrial Production	Durables
1939	109	109
1940	125	139
1941	162	201
1942	199	279
1943	239	360
1944	235	353
1945	203	274
1946	170	192
1947	187	220
1948	192	225
1949	176	202
1950	200	236
1951	240-270	300-340



Source: Federal Reserve Board; 1951 estimated by McGraw-Hill Dept. of Economics.

Aircraft production projected for 1951 will require far more rapid expansion in output than in World War II. The increase is intended to bring manufacture up to five times the present rate (which is 4 million pounds of airframes or 250 planes a month.)

Plane assemblies were tripled each 12-month period during the last war. Now it takes four times as many manhours to build a plane as it did 10 years ago. Subcontracting is bound to come into its own again if schedules are to be met in 1951 and 1952.

• • •

It is Washington's intent to spread armament contracts among many manufacturers instead of a few companies. Object is to have as many producers as possible possessing know-how should time come for an all-out war effort.

• • •

Biggest industrial building boom in history is in the making. Availability of materials is only limiting factor. Boom is tied to armament program and is given lift by five-year amortization (certificates of necessity) permitted for defense projects.

• • •

Sales by durable goods industries rose in October to 57% above previous year's level. Largest gain was in general machinery group. Spurt in durables is expected to continue and to add momentum.

• • •

It's an old story, but factory wages climbed to a new peak in November—$62.06 a week. This happened despite minor seasonal reductions in the work week. Federal plan to hold the line in wages is expected soon. Freezing of auto workers' wages was just the first step in the program.

• • •

Foundry production is on a touch-and-go basis because of pig iron and coke shortages. Scarcity of skilled shop help, especially molders, is adding to the woe. Backlogs are up to 8-10 weeks. Six-day operation is not proving out; there is not enough materials and labor to support it.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	229.8	229.8	190.7
Steel ingot operations (% of capacity)	100.1	100.8	93.1
Electric power output (million kilowatt hours)	7,032	6,985	5,994
Production of automobiles and trucks	160,431	172,307	116,567
Engineering construction awards (Eng. News-Record—millions)	$111.2	$692.0	$66.9

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production* (1935-1939 = 100)	215	212	186
Index of durable manufacturers' production* (1935-1939 = 100)	260	252	175
Durable goods manufacturers' sales* (millions)	$9,705	$9,392	$6,167
Electrical machinery manufacturers' sales* (millions)	$1,122	$1,116	$721
Other machinery manufacturers' sales* (millions)	$1,594	$1,458	$1,051
Durable goods manufacturers' sales* (millions)	$11,994	$11,500	$6,892
Electrical machinery manufacturers' new orders (millions)	$1,342	$1,423	$803
Other machinery manufacturers' new orders (millions)	$2,090	$1,948	$962

* Seasonally adjusted.

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Imagine the precision drilling machines that would be necessary to machine this piece on a non-automatic basis. Think of the space, operators, transfers from machine to machine and the time wasted. Contrast that with this specially designed Morris MOR-SPEED High Production Machine.

A single hand clamp fixture holds the work while the machine automatically indexes through four stations. The rear angular head, mounted on hardened and ground ways, carries six spindles for the spot facing operation. The two angular heads on either side alternately drill and countersink the two tap holes. Rated production of 60 pieces per hour is accomplished at 75% efficiency.

Morris MOR-SPEED Production Machines have earned the enthusiastic approval of economy minded production men in the nation's leading plants. Production time, multiple handling, delay between operations and valuable floor space have been saved. If your work requires automatic multiple drilling, reaming, tapping, boring, etc., on a mass production basis, consult Morris Engineers.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

The Three M's Are Back

Once again the nation's rearmament program is to become Metalworking's main business. For Metalworking is the heart of any such program.

Most problems confronting the metalworking industries will revolve around the three M's—materials, machines, and manpower. These problems are as real and great as in 1940, when we started a mighty defense program from scratch.

MATERIALS are the most troublesome problem of the three just now. Yet a resourceful and quick-acting management can do much to ease the situation for itself.

To illustrate: a well-known electrical-goods maker has in operation a value-analysis program. It examines every component part to see how savings can be made by redesign and by changing the production process. Recently, emphasis has shifted. Now 65% of the department's work is the finding of satisfactory substitutes for critical materials.

Another company is using molybdenum extensively as a substitute for tungsten. Several manufacturers have abandoned high-alloy steels for NE (National Emergency) steels which have a low alloy content.

MANPOWER will be increasingly a problem. Remember that Metalworking is entering this new mobilization period from a very high plateau. Manhours being worked are almost three times the total at the start of World War II.

Management will have to resort, under the circumstances, to vigorous and resourceful action to get the required manpower. Alert companies now are scouring their own communities and farming areas for men.

Many manufacturers are taking on older men. Others are recruiting women, as they did in 1941-45. They are discovering, incidentally, that many women need only a brief refresher course, as they acquired special skills in World War II.

IT IS HARDLY NECESSARY to say that manpower and machines—two of the three M's—are tied closely together. New and improved machines add spectacularly to productivity of the individual worker.

But new machines are becoming harder to get. Deliveries are long. Management will not always be able to wait until a brand-new production line is in.

That means that machines now installed in metalworking shops should be used to the best possible advantage. Close study is likely to bring to light many ways of increasing production of these machines.

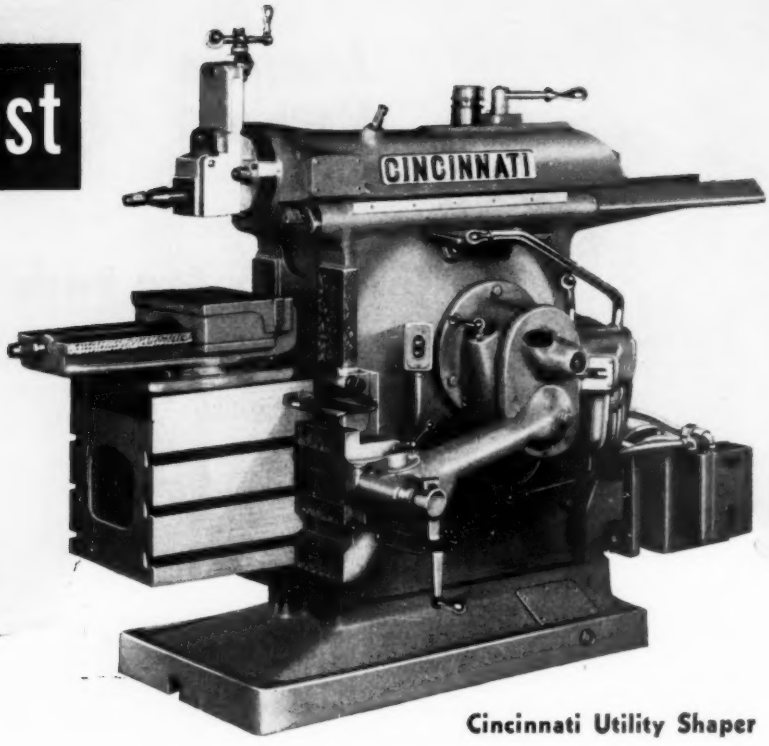
Better tooling is one way. Better and faster feeding and ejecting devices is another. Proper use of carbides is a third. Downtime of machines in many plants is appallingly long. It can and should be slashed.

A DIFFICULT CONVERSION PERIOD is upon us. It will demand unceasing and intelligent attention day-by-day to the three M's if disruption of production is to be minimized.

The thumb-twiddlers will be in trouble. Your greatest hope of success is to give top study uninterruptedly to the overshadowing problems of materials, manpower and machines.

Burnham Finney

low cost



Cincinnati Utility Shaper

The Cincinnati Utility Shaper answers the need of many shops for a fast utility tool—a handy shaper for a moderate price—but still retaining all of the essential refinements of the larger shapers.

The Utility model, equipped with the Universal Table, carries all the advantages of the Universal Shaper and makes an ideal tool for the tool room. It embodies all the other characteristics and conveniences of Cincinnati Shapers with the exception of Power Rapid Traverse. This feature may be added if desired.

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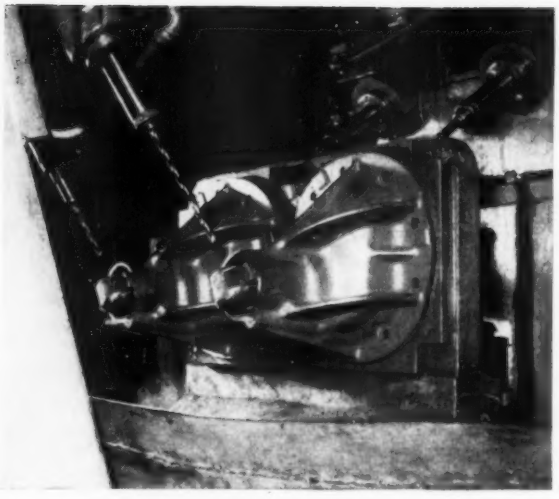


Drill adapters permit use of cheaper, short-series drills in numerous locations or of using up drills ground too short to reach the hole in another part. Short-series drills are stiffer and less likely to break

PONTIAC SAVES $100,000 ANNUALLY WITH A TOOL-CONTROL PROGRAM

Everything of potential value is saved. Then ways and means are carefully checked to use up valuable tool steel, by adapting salvaged tools to other production operations. If no longer adaptable to manufacturing purposes, salvaged tools are sent to the toolroom, die shop or maintenance department

BY RUPERT LE GRAND
ASSOCIATE EDITOR

MANY people at the Pontiac Motor Division, General Motors Corporation, have a hand in a tool-control program that is a model for both efficiency and simplicity. Here is how the program works:

Worn or broken tools, which still have value for "downgraded applications", or which can be reconditioned, are sent to a central Tool Salvage Department by toolcrib attendants in the production departments. These attendants have been thoroughly instructed in acceptable quality for salvageable tools, by means of instruction sheets.

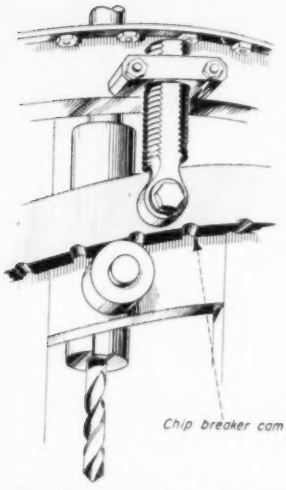
At the Tool Salvage Department, the material is sorted and placed in bins. Tools are withdrawn and reconditioned as needed. Some items are reconditioned in the plant, but volume items like step drills are sent to outside vendors who are specialists in tool reconditioning.

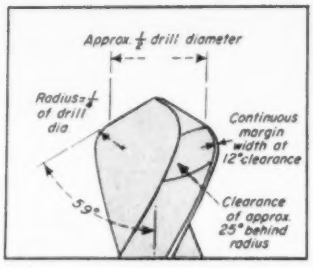
Tools salvaged include: core drills, twist drills, center drills, taps, reamers, end mills, spot facers, milling cutters, slitting saws, turning tools, and figure and letter stamps. If tools have broken tangs, they are otherwise reconditioned as needed and used on production equipment throughout the plant. Drill adapters take drills that have been ground back so they are no longer useful on the original application. And in fact, drill adapters are used with standard short-series drills in many instances on machines designed for long-series drills, in order to obtain the economy of purchasing the short series and avoiding high losses on breakage of the long-series variety.

Tool engineers check prints to find possibilities for use of salvaged tools. Sometimes, design engineers are prevailed upon to change the size of a non-critical hole so that salvage tools available in quantity from some other operation can be used up. Often, on difficult machining operations, salvaged tools are converted to carbide by cutting a slot and brazing an insert. Thus, at little expense, a superior tool is obtained, and the "shank" of the tool would otherwise have been thrown away, or an entire body purchased.

Examples of how tools can be salvaged or reused for other purposes are:

Twist Drills—When drills are too short for




Approx. ¼ drill diameter
Radius = ¼ of drill dia
Continuous margin width at 12° clearance
59°
Clearance of approx. 25° behind radius

Ball nose grind dissipates heat in drilling deep holes in cast iron and steel. Ratio of drilled hole depth to diameter is usually 1½:1

Chip Breakers ground 0.020 in. deep in feed cam of Davis & Thompson rotary drilling machine avoid drilling troubles. Chip breakers are spaced irregularly so all spindles do not raise and lower at same time. Drills are changed at intervals of 24 hr or approximately every 800 holes

further use on a given operation, they are transferred to other jobs that permit employment of short drills.

In balancing the crankshaft, an automotive series, 7/16-in. drill, short length, is used. Original drill length is 6⅛ in.; usable length for regrinds is 1⅛. Now the drill, instead of being scrapped at 5-in. length, is transferred to drilling the differential carrier. About ½ in. of further drill life is obtained. A plentiful supply of tools is available, because the crankshaft-balancing operation requires 200 new drills per month, while the differential carrier needs only 50 drills.

An operation on the cylinder block required a 5/16-in. long-series drill, the expensive type. To avoid buying drills, the shop now collects oil-hole drills when they become too short for further use on the crankshaft. These drills have the point thinned and the angle reground for cast iron, and give satisfactory service on the block.

Quantities of long-series drills, when too short for the original application, are now used for drilling the camshaft. The hole required was originally 3/16 in., but was changed to ¼ in. by agreement with the engineering department when the economy of using salvaged drills was made evident.

A 15/32-drill, scrapped from a cylinder-block job, when ground back to a length of 4½ in., is now used for making a step drill required for another operation. Formerly, a short-series drill had been purchased and a portion cut off and the step ground.

A 59/64-in. drill, when scrapped from a cylinder block operation at a length of 8½ in., now replaces a 31/32-in. drill on the differential side carrier. Here, again, an engineering change permits both economy and simplification of tool purchasing and stocking.

If a machine will not accept modified, or short, drills, the adapters are changed if the savings warrant. Adapters are very important to tool savings. On one job that formerly required an expensive 11-in. long special drill, a standard 6-in.-long drill is being used in an adapter. On other operations, Pontiac uses short length drills with heavy web plus adapters to obtain economy and reduce breakage.

Tap Drills—Before review of all tap drills used in the shop, Pontiac had as many as three sizes of tap drills for 3/16-in. holes. This condition was brought about by specifications written at various times by different engineers. Now one size of tap drill is used for a specific tapped-hole size. In all cases, the same percentage of thread is now obtained. Economies are: savings in tap drills, drill drivers and bushings.

Drills are now purchased with a square end on the shank, like a tap, so the driver grips the tool more effectively. Drills that have been ground too short for any production operation are turned over to the toolroom, maintenance department, sheet-metal shop, etc. Obviously, there will be a surplus of drills no matter how carefully the tool-control program is followed. But a great many more holes per tool are now secured.

Taps—By reworking worn taps to a smaller size, savings up to 40% are being realized. The taps are purchased with a web heavier than standard. When the tap is worn below size, the teeth are ground off and new teeth are ground. Examples: ½-20 down to 7/16-14 and 9/16-18 to ½-13. And taps like 7/16 are now purchased with same shank size as the ½-in. size, because it has been found that the heavier shank reduces tap breakage by one-third.

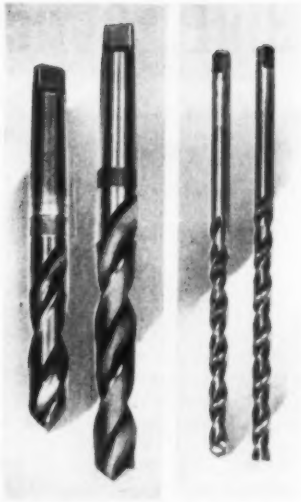
Special taps are quickly made from scrapped larger taps. A ⅝-in. was converted to a 9/16-12 double-lead tap, saving weeks of delay and about 65% in cost.

To salvage taps in this fashion, the toolroom must be equipped with a thread grinder.

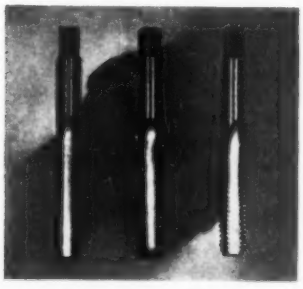
Reamers—On a connecting-rod operation, a 0.964-in. reamer is used in quantity. When no longer usable on this operation, the tools are reground to 0.960 in. for another job on the cylinder block.

Scrap taps are converted to reamers by grinding off the teeth. They are driven by a 4-slot driver (Scully-Jones type) and are thereby gripped more firmly than with conventional drive and give better results than the usual reamers.

Center Drills—Double-end center drills of 0.300 in. dia provide a small blank about 1 in. long from which chamfering tools can be made. Ends of the worn or broken center drills are merely cut off in the toolroom.



Valuable drill steel is used up, by salvaging 59/64-in. drills (left) from a cylinder-block operation and re-issuing them from Salvage to drilling the differential side carrier, as required. **When oil-hole drills** (right) are too short for work on camshafts, they are repointed and thinned for drilling a deep hole in the cast-iron cylinder block



Taps are recut on a thread grinder. Teeth are ground off the old tap, providing a blank of high-quality material from which a tap of smaller size can be made

Chamfering Tools—Worn $\frac{7}{8}$-in. spotfacers (used on connecting rod) are cut and resharpened for chamfering tools. Now, no chamfering tools under $\frac{7}{8}$ in. are bought.

End Mills—When 1.071-in. end mills are worn they are ground to 1.060 in. dia for use as semi-finishing tools. This practice saves wear on the finishers.

Pilots—A two-piece pilot saves breakage at the corners of the teeth. This device consists of a Parker-Kalon screw and a bushing. Breakage is practically eliminated. The modification costs one-eighth as much as purchased tools with high-tolerance pilots.

Milling Cutters—Most of these are special cutters for production purposes. When no longer usable on the assigned operations, appropriate sizes and types are saved for use on tool, die and maintenance work.

Form Tools — Originally, form tools are $4\frac{1}{2}$ in. long. When they are ground back to 3 in. length in service, they are removed and the last $1\frac{1}{2}$ in. is cut off and brazed to the shank of another worn tool, thereby restoring it to the original length. Sometimes three worn form tools will make two new tools, depending on shape, length required, etc.

Single-Point Tools—Crankshaft cheeking tools are a major source of perishable-tool cost in a motor plant. These tools were ground on the top and opposite ends, thereby obtaining only two corners for a cutting edge. The new tool has the top face ground straight across, and the toolholder incorporates the angles. Now the tool is usable for a length from 9 in. down to 4 to $4\frac{1}{2}$ in., the corners are stronger and breakage is less than half that for the original setup. Tools salvaged from this job are converted into tools for stem pinions, the camshaft, etc., because a square or rectangular cross-section has high utility value throughout the plant.

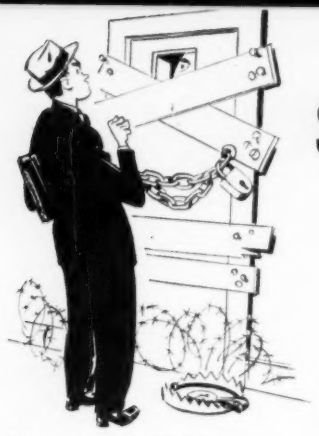
In laying out a job the tool engineer plans the stepping down of toolbits from one operation to the next. On a given part, one tool may start with a length of 5 in., and stays in that cutting position until it is ground down to $3\frac{1}{2}$ in. Then it is transferred to another station where a $3\frac{1}{2}$ in. long tool can be used until ground to say $2\frac{3}{4}$ in., and finally to a third station where the tool is still usable to a length of $1\frac{1}{2}$ in.

Cast-alloy toolbits are purchased for a job requiring $5 \times \frac{5}{8} \times 1$ in. After being ground down to $2\frac{5}{8}$ in. they are silver brazed to a cold-rolled steel shank to restore the original length, and to use up the valuable cutting material represented by the stub ends.

Slitting Saws — Connecting-rod caps are parted from the rod with a slitting saw $6\frac{1}{8}$ in. dia by 0.135 in. thick when new. When the saw has been reground to a dia of $5\frac{3}{4}$ in. dia, it no longer operates at sufficient cutting speed on this job, but it is suitable for a sawing operation on the cylinder block. Thus, salvaged saws are used on the block, and new $6 \times \frac{1}{8}$ in. saws are no longer purchased for the block job. An engineering change was required and obtained, in order to make this use of salvaged saws acceptable.

Small Tools—Several thousand dollars are saved annually by substitution of 2-lb. malleable-iron for 3-lb. brass hammers. The malleable-head hammer (originated by Chevrolet) lasts two to three times as long, does not chip like brass. Probably, designs will be worked out for 1-, 3- and 6-lb. hammers, so that tools of proper striking force for various jobs will be available. A better handle and wedge have also been worked out.

Sockets for pneumatic wrenches are collected and ground to remove battered portions, then returned to service. Adapters are being eliminated and the socket mounted directly on the nose of the tool. Where magnetic sockets are used, the magnetic portion of a scrap socket is pressed out and then reinstalled in a new socket body.



SO YOU CAN'T HIRE YOUNG

Top Brass in industry has had much to say about its inability to hire the right kind of men for executive jobs. Perhaps the other side of the picture, as presented here, may tell why

BY AUSTIN M. ELLIOTT

IT'S TIME, and high time, that industry woke up to the fact that good young executives are not the scarce commodity that the high muckamucks profess to believe.

We who are candidates for junior-executive positions find the situation bewildering. For years we have been told that, while our knowledge, experience and background seem thorough, our appearance is too youthful. Now if we had a little gray in our hair! But don't they say "Young executives"? This is just a modification of the old story that faces every beginner. Nobody wants to hire him without experience, but nobody explains how to get the experience without being hired.

But the real rub comes at the job interview. An appointment has been made with the employment manager, and you have sent him a complete, detailed résumé covering 12 years of experience in exactly the desired field. At the appointed time, you arrive at the office, which turns out to be the "bull-pen" for the plant's labor market. The young lady at the reception desk is visibly not impressed by your statement that you have an appointment. It seems that filling out an application is the first thing.

You complete the multipage form, hand it in, and sit down to wait—that is if there are any seats vacant. The air is heavy with tobacco smoke, a hint of garlic, and the odor of many bodies in a closed room. You're not a snob, but some of these same people will probably be under your charge—if you get the job—and it will not help your prestige when they recognize you as the guy who was hired the same day, and through the same channel.

An hour later, and several degrees hotter, you ask the sweet young thing if you don't have an appointment, or a number, or something. Perhaps she senses that you have reached the blow-up point, and with a murmured "I'll see," she disappears through a door marked "Private." A few minutes later you are ushered in to see the boss. General questions are asked, all of which are answered in both the résumé and the application, at which he has made several out-of-focus glances. Your asking salary is ascertained without comment.

What About Salary?

Then comes an interview with the head of the department which has the vacancy. Technical and personal questions are answered satisfactorily, and there is no doubt in either mind that you are fully capable of coping with the job. But somehow you can't find out what it pays. Subtle hints and bald questions meet only careful evasions.

Because of continued statements in the press that the worker is interested only in the hours, paid vacations, pensions and pay, many job seekers hesitate to inquire about these matters for fear of being classed with those whom employers profess to scorn. And employers are not slow to make capital of this.

Well, what's wrong with asking about pay? The only real reason for working is to earn money with which to live. Platitudes about the rewards of virtue and the sense of well-being in accomplishing one's daily task are well enough if used as a leavening to the loaf; but they are a mighty poor substitute for the main part—the dough.

Why then this hanky-panky about salary? It is no different from trading for any other commodity. Any professionally trained man who has followed his vocation for 10 years or so should have a fair idea of his own worth. Similarly, an employer should be willing to pay the salary carried by the job. No one wants to find out —as he will eventually—that the previous incumbent received more pay for the same work. Nor, if given the job at his own figure, does he want to feel that when the economy ax begins to fall he will stick out on the salary list like a sore thumb. Nor again, when increases are being considered, does he want to be by-passed because he is 'way over standard. If a man's asking price is too high, tell him so and have done, or give him an opportunity to negotiate.

How About Raises?

Consider, too, the matter of increases. Many employers are wasting the psychological good of periodic increases or, what is worse, applying a reverse twist. More good is done by intermittent, if small, frequent raises, accompanied by fair praise for consistently good work or for some outstanding job, than can be achieved by larger annual ones for which the employee must ask. As for the practice of never giving an increase except when asked, and then holding it back for several months, this is merely s h a b b y administration which costs the company far more than it supposedly saves.

But to return to the job interview. You have shown that you have the ability to handle the work but, because it is of an executive nature, you must now see the "big

EXECUTIVES!

boss," and an appointment is made for the next day.

You arrive on time, but it seems that Mr. X has not come in yet, or is in conference and cannot be disturbed. There is no excuse for such discourtesy, either on the part of the executive himself or the company that tolerates it. If some urgent business interferes common courtesy demands at least an apology.

Two hours drag by before the secretary announces that "Mr. X will see you now." You're not in good shape for an interview; the long wait has made you nervous and irritable, but you console yourself that this is the last hurdle.

Meeting the Big Shot

To be able to say that the interview sparkled with the personality and deft, searching questions of the big boss would furnish a happy ending for those who believe that all executives are necessarily big men—big in personality, spirit, manner and thought, so as to leave no doubt as to the reason for their success. But all too frequently it turns out that they are very small.

It seems they want a top-notch job done and the need is urgent. However, they propose to pay only a token salary. Just how much is not mentioned, and no amount of finagling can get it out. But it is pointed out that this salary is for only a period of six months or so, (how long is "or so") and then, of course, if they find they were wrong (wrong about what?), the increase would be immediate. How much will the increase be? No comment! These conditions are imposed because their problems are different and more complicated than anyone else's.

Now just when are executives going to stop kidding themselves and trying to delude others that their p a r t i c u l a r troubles are unique. Any man who has spent any time in industry knows that most people have the same kind of troubles, and if they are insoluble in one particular plant, either they don't exist at all, or they are the result of mismanagement.

You need a job badly, but with a proposition like that you decide it isn't worth while. So you walk out and start the weary old round all over again, while the top executive complains bitterly that "You can't hire good young executives any more."

Let's Be Practical

Let's look at this thing from a realistic point of view. The younger generation is not chasing the almighty dollar at the expense of life, liberty and the pursuit of happiness, and has no idea of being married to the job. Oldsters may scorn this as the wrong attitude, but the young executive is becoming more determined that his weekends are his own. If duty demands that he work Saturday and Sunday, all well and good, but why not pay him for these extra hours. What has the laborer suddenly acquired that makes his presence worth double what it is on weekdays, when the executive who may have invested $10,000 in his education is there for free?

Being pushed around for years at a straight salary and long hours on the elastic promises of a bright future and a high salary he may never see, loses its appeal when he reads the obituaries of senior executives checked in mid-career by a worn-out heart. And a reserved place in the "Junior executives' parking lot" (better known as the boneyard) is poor compensation for driving the prewar jalopy past the rows of shiny 1950 models driven by overall-clad, lunch-bucket-swinging factory workers. Which brings up another point. It isn't dignified for a junior executive to eat a sandwich at his desk, or lunch in the cafeteria. He is expected to eat in the private dining room—a dollar and a half a throw.

We young fellows don't expect to be coddled, but we would like a little of the Golden Rule from the high brass. It makes interesting listening when the would-be tycoon sounds off about how he shovelled his way across, but it loses its point if his daily actions and plain bad manners show that he's still shovelling. Perhaps we were brought up to be gentlemen, but we've still served our share of time on the foundry floor, the mucker's cart, or the business end of a broom, and then dragged ourselves off to night school clear across town in a howling blizzard.

We agree that promotion should come from within the organization, but it should be made on the basis of a man's executive ability rather than on nepotism, length of servitude, yessing ability, or the fact that he and the company founder nailed up the first crate together. Sure, the old-timer deserves substantial reward for his loyalty and service, but this should not take the form of an executive position unless he shows definite administrative ability.

When the company expands to a point where it must bring in specialized young talent, engineers, accountants, administrators, they cannot be expected to give of their best when subordinated to an oldster who does not have the slightest conception of their science, and will neither learn nor listen.

How It Ends

The outcome is obvious. Either the young man moves on to a more congenial atmosphere, or he becomes stamped in the boss's mold and develops eventually into an ulcerous, cantankerous, mean old man devoid of any consideration.

Where is the profit in making it hard for the other fellow? Do they feel so secure in their own jobs that they lose all perspective and all feeling for the fellow on the outside. Take the matter of résumés. Advertisement after advertisement requests, nay demands, that you send complete personal, private d e t a i l s you wouldn't divulge to close friends. Yet acknowledgments are rare, very rare, even when a stamped, self-addressed envelope is enclosed.

So there you have it Mr. Senior Executive. There are some of the reasons why you can't hire good young executives. They exist all right, they're young, they're good, and they're executive timber, but you can't hire them until you learn to treat them, not as you were treated 50 years ago, but as you would expect to be treated today.

GOOD CARBURIZING PRACTICE

VI...Choose Steels for Case and Core Properties

Always specify the carburizing grade of a specific analysis so the mill can supply material properly processed to produce satisfactory case and core properties, plus good machinability

BY T. A. FRISCHMAN, Chief Metallurgist
AXLE DIVISION, EATON MFG. COMPANY

MOST CARBURIZING operations are confined to low carbon steels, below 0.25% carbon. An exception is Amola-type steel (SAE 4000 series carbon-molybdenum) with carbon content up to 0.38%. This steel must possess other characteristics such as controlled abnormality, fine grain size and freedom from residual elements commonly occurring in un-selected melting scrap. The accompanying table gives the chemical composition of typical carburizing steels.

Plain carbon steels are not as simple in handling for carburizing as might be thought. Many different processes and steel-mill practices are employed, hence all grades or makes are not applicable to the carburizing process.

If carburizing of a part is contemplated, the specification should be so worded, or else the blueprint should carry an appropriate note. Otherwise, the steel may not fully harden after being carburized.

Carburizing-grades of plain steel, say SAE 1019, should be at best fine grained and properly deoxidized, or what is known as "killed" steel. Abnormal carbon steels, especially those having low silicon and manganese contents, are difficult, if not impossible, to harden at times.

Plain low-carbon carburizing steels can be carburized by any of the conventional processes, and should be water or brine quenched if maximum surface hardness is desired. If distortion is too great, quenching in oil becomes necessary at some sacrifice in surface hardness. Only rarely will there be any appreciable core hardening effect, unless sections are thin and carbon and manganese contents high.

Wide application is made of plain low-carbon steels to all sorts of carburized parts designed for light loading applications. Here, core hardness and fatigue resistance are of secondary importance, and resistance to impact is not a factor. At sub-zero temperatures such steels, when carburized, lose shock resistance rapidly compared with alloy steels.

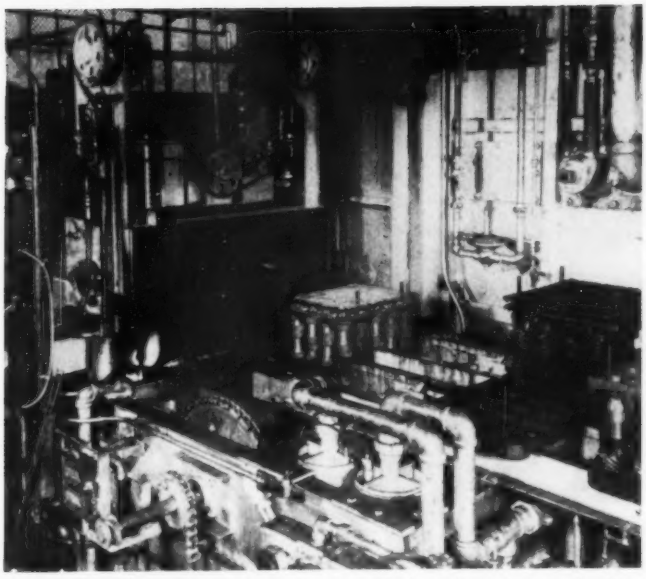
Lower initial cost justifies use of plain carbon steels, if they will do the job satisfactorily and manufacturing costs are not increased thereby. There is no point in using alloy steel where a carbon grade will do. The latter is less prone to form residual austenite on direct quenching from the carburizer. Maximum surface hardness can also be obtained. Alloy additions generally decrease surface hardness below that attainable with equivalent carbon content in plain carbon steel. However, plain low-carbon carburizing steels usually do not machine too freely.

Consider the carbon-manganese steels for applications requiring moderate increase in physical properties over that obtainable with plain carbon steels. An example is SAE 1320 with 1.60-1.90% manganese. As compared with plain carbon steel, the higher manganese content devolps higher core hardness and core strength, along with more positive response to the development of the desired case hardness. This grade of steel can be used for important parts like gears, pinions, spline shafts, rockers, levers, pins and a host of others. A serious drawback is vulnerability to "incidental" or "residual" alloying elements such as chromium, molybdenum and nickel.

CHEMICAL COMPOSITION OF CARBURIZING STEELS

SAE No.	% CARBON	MANGANESE	NICKEL	CHROMIUM	MOLYBDENUM	VANADIUM
1010	0.08/0.13	0.30/0.60	—	—	—	—
1019	0.15/0.20	0.70/1.00	—	—	—	—
1320	0.18/0.23	1.60/1.90	—	—	—	—
2517	0.15/0.20	0.45/0.60	4.75/5.25	—	—	—
3120	0.17/0.22	0.60/0.80	1.10/1.40	0.55/0.75	—	—
3316	0.14/0.19	4.45/0.60	3.25/3.75	1.40/1.75	—	—
4017	0.15/0.20	0.70/0.90	—	—	0.20/0.30	—
4037	0.35/0.40	0.70/0.90	—	—	0.20/0.30	—
4320	0.17/0.22	0.45/0.65	1.65/2.00	0.40/0.60	0.20/0.30	—
4620	0.17/0.22	0.45/0.65	1.65/2.00	—	0.20/0.30	—
4820	0.18/0.23	0.50/0.70	3.25/3.75	—	0.20/0.30	—
5120	0.17/0.22	0.70/0.90	—	0.70/0.90	—	—
6120	0.17/0.22	0.70/0.90	—	0.70/0.90	—	0.10 min.
8620	0.18/0.23	0.70/0.90	0.40/0.70	0.40/0.60	0.15/0.25	—
8720	0.18/0.23	0.70/0.90	0.40/0.70	0.40/0.60	0.20/0.30	—
9310	0.08/0.13	0.45/0.65	3.00/3.50	1.00/1.40	0.08/0.15	—

Phosphorus, sulfur, and silicon contents not listed



Large labor savings are possible with mechanized, continuous gas-carburizing furnaces. Here at the discharge end, workpieces can be removed through the discharge doors for press quenching of ring gears or left on trays for automatic quenching into a tank *Holcroft & Co.*

Manganese above 0.70% is a potent element in causing hardenability. Residual elements referred to in combination with manganese can bring about a core hardness considerably higher than desired from a brittleness standpoint.

Other leaner-alloy carburizing steels are SAE 5120, a low-carbon chromium steel, with chromium content in the range 0.70-0.90%, and also SAE 4017 through 4037. The latter are low- to medium-carbon-molybdenum steels with moly content of 0.20-0.30%. They develop good combinations of case hardness and core properties. Such steels can be conditioned inexpensively for high efficiency machining operations and respond well to conventional carburizing and hardening methods. In fact, they are less of a problem in many respects than the more highly alloyed carburizing steels.

Steels discussed thus far comprise one alloy addition to the base carbon steel. Addition of only one alloying element does not necessarily result in a steel with physical properties intermediate between no alloy and more than one alloying element. In fact, SAE 2517 steel, which contains only nickel, is considered virtually the equal of SAE 3316 steel, which includes chromium and nickel.

Unquestionably, single high-nickel alloy steels develop a desirable combination of properties. These include good wear resistance, high hardness, and a fatigue-resisting case, along with excellent core hardness and toughness. However, their hardened, carburized cases are less resistant to tempering or softening in service where high operating temperatures are encountered. In fact, a tempering temperature as low as 300 F causes a slight drop in hardness of the case, and a greater drop in resistance to the file. Another disadvantage is the effect residual elements in the melting scrap have on the hardenability of the steel. High residual chromium is serious enough, but in combination with residual molybdenum, the resultant steel acts markedly different than expected. The difficulties alluded to cause trouble in annealing to proper hardness for machining, and result in unusually high core hardness and large quantities of residual austenite, unless special hardening precautions are taken.

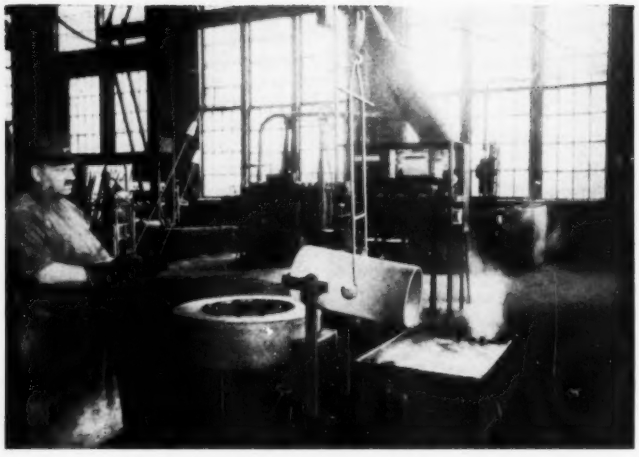
Nickel-alloy carburizing steels are not directly quenched from the carburizer as a rule, in contrast to other single-alloy steels. On the other hand, because of their lower transformation temperatures, relatively low hardening temperatures can be employed. These aid in reducing scale and distortion.

Double-Alloy Steels

The mere fact that only two alloying elements are incorporated into a carburizing steel does not infer that the triple-alloy type is correspondingly better. In fact, prior to World War II, only one triple-alloy carburizing steel (SAE 4320 nickel-chromium-molybdenum) was used to any extent. The above steel was the forerunner of wartime national emergency steels and the SAE 8000 and 9000 series.

Among double-alloy type steels, there are the well known SAE 3100, 3300, 4300, 4600, 4800, and 6120 steels. The SAE 3100, 4600 and 6120 steels have somewhat similar core properties but case characteristics differ considerably. Relative abilities of these steels to absorb carbon under standard conditions are: SAE 4620, lowest; SAE 3120, next; and SAE 6120, highest. Carbon concentrations at the surface of SAE 4620 and 6120 under the same conditions (gas carburized at 1700 F with 50% natural gas and 50% exothermic diluent gas) are approximately 1.09% and 1.82% respectively. This is a profound difference. It illustrates the effect of alloy additions as to whether the elements are core strengtheners or case-carbide formers. As a general rule, SAE 4620 steel will have a higher core hardness than 6120 steel in equivalent sections hardened under like conditions.

The SAE 3115, 6120 and 4620 steels can be direct quenched from the carburizer. But if reheating treatments are employed, SAE 3115 and especially SAE 6120 require higher rehardening temperatures than SAE 4620. Thus, a scale problem is created if furnace atmosphere control is not available. Also



An entire basket or load of parts is direct quenched from pit-type carburizing furnaces, by spilling or dumping individually into oil, if nicking or distortion are not problems *Hevi-Duty Electric Co.*

increased distortion occurs from the higher hardening temperature. For example, SAE 6120 requires a rehardening temperature as high as 1560 F for effectively putting as much of the core in the solution as is possible.

The above group of steels, particularly SAE 4620, is used to a great extent in automotive-gear applications, machine-tool parts, roller bearings, oil-well machinery and many similar applications where good surface hardness and good resistance to shock and fatigue are required. They do not, however, harden out fully in large sections, because they are not sufficiently alloyed to develop deep hardenability.

The SAE 4320 steel handles much the same as SAE 4620, but higher core properties are attainable. In fact, they simulate those obtained with SAE 4817 steel. But do not regard these steels as being similar. The higher nickel SAE 4817 steel has been known to produce a more fatigue-resistant or longer life gear in heavier sections than the SAE 4320 steel. However, SAE 4320 steel fulfills the need of a steel between the SAE 4620 grade or its equivalent and the SAE 4800, 9300 3300 and 2500 series steels. The SAE 4320 is used for heavy-duty transmission gears, intermediate-size roller bearings, rear-axle drive gears, and aircraft parts.

Higher-alloyed steels such as SAE 4800, 3300, 2500 and 9300 are known for excellent performance under every conceivable condition of high stress and shock. But they cause problems in manufacture as far back as in the steel mill, through the operations of forging, annealing for machining, the machining operation itself, and finally in carburizing and heat treating. These materials require special annealing cycles, either of the isothermal type or the normalize and temper type, to render them economically machinable. In comparison with leaner alloy steels, they must be machined at reduced speeds and feeds. Even then the final surface finish is not always as smooth as desired.

In carburizing highly alloyed steels, either reduced temperatures are necessary or a carburizing medium of exceptionally lean carbon potential must be used. Otherwise. the tendency is to form too much residual austenite. In heavy-duty applications, residual austenite is not desired, because of its tendency to deform under load, and because of less wear resistance in comparison with the hard martensitic case.

Temperature and Time Factors

The greatest single factor in bringing about depth of case penetration is temperature, regardless of whether carburizing is accomplished with the pack, gas or liquid-salt methods. The higher the temperature above the upper transformation range, the greater will be the solubility and rate of diffusion of carbon in the austenite. Example: (Refer to p 91, Dec. 25, 1950). Suppose the carburizing temperature with deep-case salt should be 1700 F and for some reason 1750 F is experienced. At the end of 4 hr instead of having 0.048 in. case, the depth would be 0.058 in. This difference is equivalent to the depth that would be produced by an additional 90 min. at 1700 F.

Besides causing rates of penetration for case depth to increase rapidly, the temperature at which carburizing is conducted influences the degree of austenite retention. Conversely, the lower the temperature, the lower is the maximum carbon absorption. Carbon content in excess of 0.75 to 0.85% (eutectoid composition depending upon the alloy content) will cause formation of excessive austenite, and even carbide. Thus a lowering of hardness from its maximum is caused when the case is direct quenched from the carburizer.

High-Alloy Steels

High-alloy steels such as SAE 2517, 3316 and 9310, when used in applications requiring case depths 0.060 in. or greater, should not be carburized much above 1650 F. if residual austenite is undesirable. This is true, unless special precautions are taken, such as: (1) lowering the carbon potential of the carburizing medium, (2) employing a diffusion period, (3) reducing the temperature before quenching, (4) reheating after either direct quenching or pot cooling, and (5) hastening the speed of quenching.

With cases of high carbon content in conjunction with high alloy content, the cases upon direct quenching can approach a hardness value as low as Rockwell C 45, and may still be file resistant. As a rule, the higher the carburizing temperature the greater the movement, as well as distortion, from soft to hardened condition of the part.

Deterioration of the carburizing equipment such as containers,

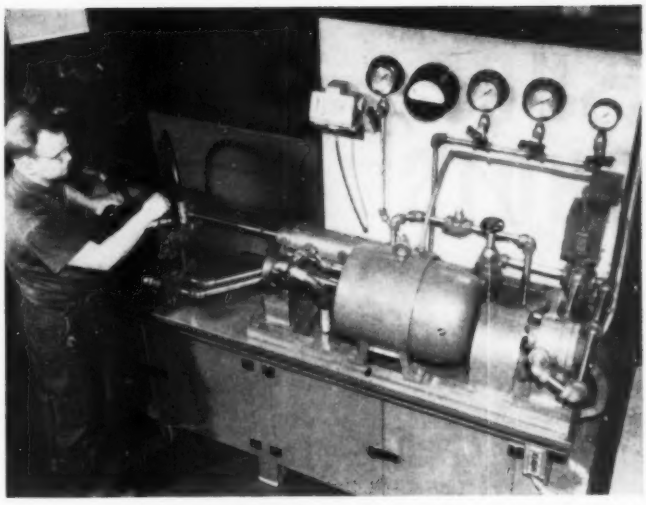
covers, furnace parts, rails, radiant tubes, trays, fixtures, muffles, retorts and the like is also accelerated with higher temperatures. For the various reasons cited, the predominating carburizing temperature range in most large plants is 1650 to 1700 F, with 1700 F the most common.

Higher Normalizing

Another precept generally followed by plants operating on a large-scale basis is to employ normalizing or annealing temperatures which exceed the carburizing temperature. Thus, secondary movement or distortion in carburizing will be minimized. High rates of heating to the carburizing temperature apparently are not detrimental, for in liquid salt the rate is very high and distortion is low. But fast heating is undesirable if a condition of non-uniformity in the rate exists. In gas carburizing, whether in retorts or in continuous furnaces the heating rate is relatively fast, especially in furnaces equipped with fans. Since the parts are not covered but are exposed to radiant and convected heat, too great a differential in heat does not exist between the parts to be carburized. In pack carburizing where the heat is transferred to the workpieces by conduction only, the heating rate should not be too fast. This is especially so in large boxes 12 in. dia upward or rectangular boxes of large cross-section. Otherwise, parts near the bottom, sides and top reach carburizing temperature far ahead of the interior contents. In 16-in.-dia boxes, case-depth differences of 0.012 in. have occurred because of this condition.

Time is the complement of temperature. As long as the temperature remains constant and the carburizing medium is effective and unvarying, time is the measure of case depth that will be attained. Small differences in time are not nearly as effective as temperature in causing case-depth variations. Rate of penetration of carbon decreases with time, as shown by published curves.

A further instalment will appear in AM *for Feb. 5.*



Test of hydraulic valve is made with motor pumping oil through two-way solenoid valve, relief valve, valve under test, and flo meter (at left on panel). One of four pressure gages is cut in with shut-off valve. Third meter from left is a wattmeter

Testing Your Hydraulics Pays Dividends

CHECKING repaired hydraulic pumps, valves, and cylinders *before* they are put back into service is a sensible policy. International Harvester does this at the Fort Wayne plant, where a special bench is set up to test pressures to 1500 psi, valve capacities and leaks to 50 gpm, and cylinder strokes of any normal size.

The problem is: repaired, refitted, and reconditioned hydraulic devices often are out of adjustment when they are re-installed in machines and attachments. Normally this means that a second tear-down is necessary, which ties up extra labor, time, and keeps the machines out of production longer than necessary.

Last year's trade-apprentice class was assigned the job of studying the problem in classrooms, then building a test stand—including all parts. Services of apprentice toolmakers, machinists, electricians, plumbers, and pipe fitters were required, so all of the class had a hand in the development. Work included inspection trips to other plants where hydraulic equipment is made.

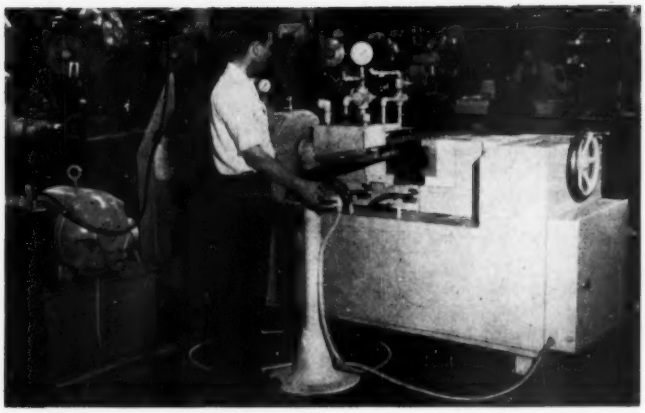
The result is a convenient, simple, and efficient unit. Equipment includes a 30-in.-high bench, a 5-hp, 1160-rpm, double-end reversible motor that will drive either a permanently mounted service pump or a temporarily mounted test pump. A two-way solenoid valve is connected into both the electrical circuit and the hydraulic circuit to operate the motor in the right direction for either pump. The permanent constant-displacement pump at the right delivers 17.1 gpm at 1000 psi for testing valves and other equipment. Test pressures from 80 to an overload of 1500 psi are possible.

The left-hand pump location is blocked up for different test pumps, but is normally fitted with a 10.3-gpm constant-delivery pump.

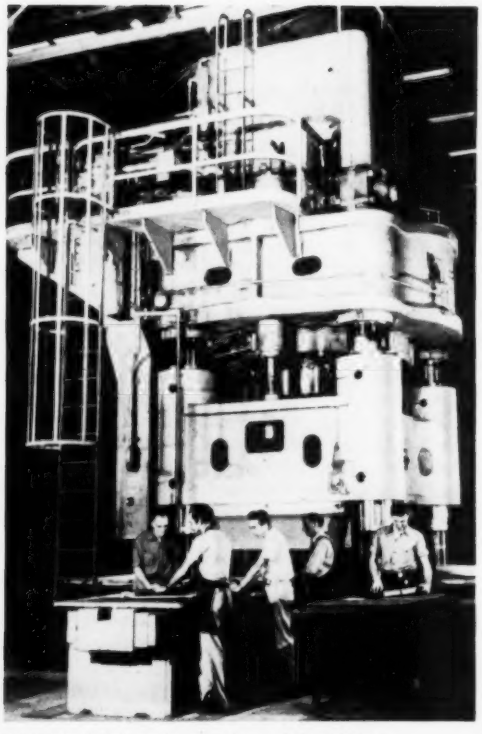
Two 4-in.-dia, 11-in.-stroke double-acting cylinders are mounted with their rods connected together for testing control valves. This set has a single pressure gage with a 1000-psi capacity.

The flowmeter in the return line is a Bowser unit which registers total gallons delivered. Rate of flow is checked with a stopwatch.

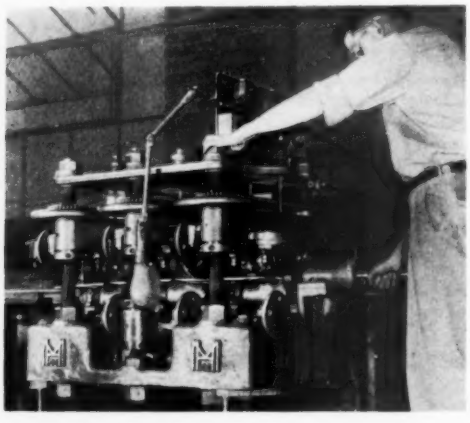
SHOP SHOTS

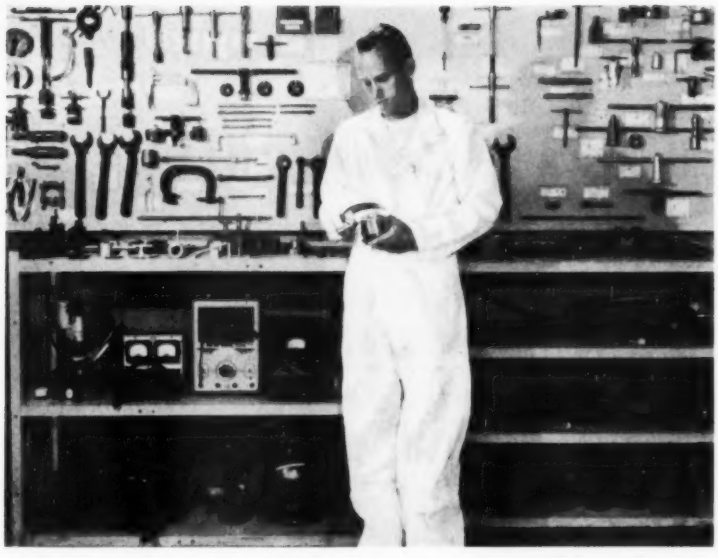


Joggling machine bends 360 aircraft longerons per hr, taking place of three punch presses. Pressure up to 80 tons is exerted on extruded or rolled sections up to 7 x 7 in. and any length. Control is automatic through electrical timers, with bends set by handwheels. *Boeing Airplane.*



B-47 Stratojet parts are formed in 5000-ton press weighing 438 tons. Two automatic and two hand-operated work tables feed sheets up to 120 x 48-in. at 2 cycles per min. Single rubber die cushion presses stock around one or more dies. *Birdsboro Steel Fdy & Machine Co.*

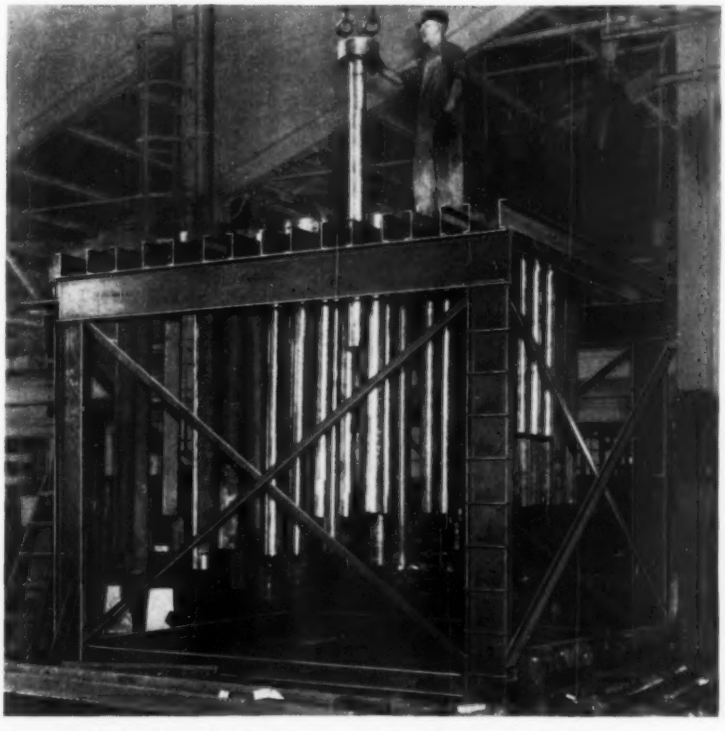




Tool-board setup at factory mechanics' school speeds training and repair work, both. Full equipment inventory includes all hand tools, test equipment, and emergency devices for motorcycle repair. *Harley-Davidson*

Rotary straightener takes stainless and nickel-alloy tubing from ¼ to 1½ in. and reduces set or bow to under 0.020 in. per ft. Six guideless crossed rolls straighten tubing with walls as thin as 0.003 in. *Mackintosh-Hemphill Co.*

Centrifugal casting machine in Federal-Mogul plant produces large solid bronze bearings and lines steel or bronze bearings. Equipment is 31-year-old turrent lathe with bed chipped away, base removed, filler spout added to turret slide, and bearing adapter added to faceplate. *Warner & Swasey.*



Storage rack for large forging-hammer piston rods saves space by stacking vertically. Two holes are drilled and tapped in flange end of rod, and eyebolts are inserted so crane can lift them. Support-channel spacing varies to accommodate different rod sizes. *Erie Foundry*

MODERNIZED HEAT-TREAT UNIT IMPROVES QUALITY, CUTS COSTS

Most heat-treat departments "just grow" like Topsy and are woefully inefficient . . . Here's how one plant finally cleaned house—and saved money on the deal

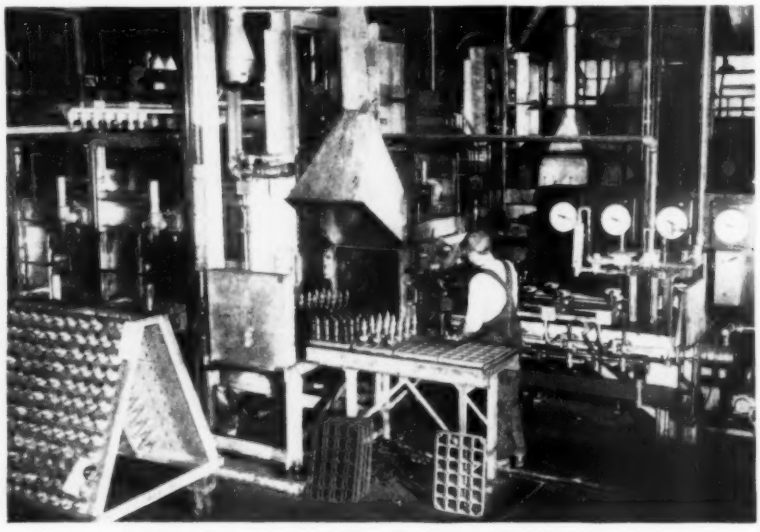
BY E. F. JOHNSON, Plant Layout Engineer,
and C. C. MILLER, Plant Equipment Engineer,
Fort Wayne Works,
INTERNATIONAL HARVESTER COMPANY

MORE THAN 500 different truck, tractor and farm-implement parts are handled in the heat-treating department at the International Harvester Company's Fort Wayne (Ind.) Works. This department occupies an entire building of 55,200 sq ft and employs about 200 workers. Complete modernization, recently finished at a cost of about $1 million, has resulted in a substantial cost reduction.

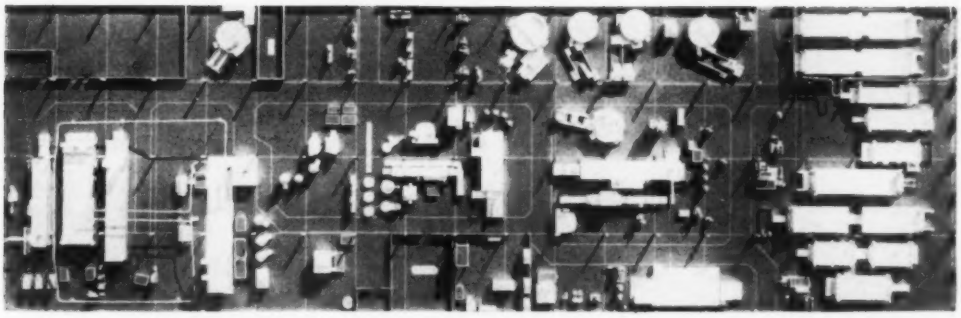
Since the department was last modernized, in 1937, changes in production requirements, steel and heat-treating specifications, cleaning methods, and improvements in available equipment required new and additional furnaces. In many cases, there was not sufficient space to make these installations at the most desirable locations. The result was an inefficient arrangement which penalized operations and kept costs at too high a level.

As the result of a study by a special plant committee, the entire setup was rearranged. Required production capacity of all new equipment in the new department was based on processing parts for normal truck production at Fort Wayne, as well as parts heat treated for other Harvester plants, in a 16-hr day, five-day week. This allowed a time safety factor of 23% for weekly empty-out, changing heats and miscellaneous repairs, and 10% for heat-treating service parts.

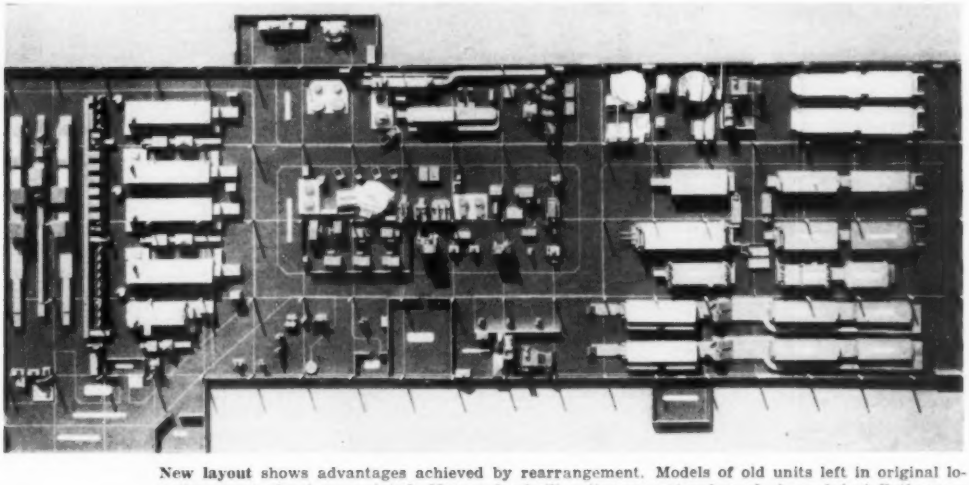
With the old setup, the average carburizing load, based on a five-day week, was 26 hr a day, and the rough-stock furnace load was 23.3 hr. With these loads it was necessary to work seven days a week to meet production schedules, which



Located side by side, five Surface Combustion, radiant-tube, gas carburizing furnaces do the work previously processed through a varied assortment of box pack, muffle and radiant-tube furnaces scattered throughout the old dep't. Control instruments are mounted near the units to which they refer



Original layout of heat treat dep't. Three-dimensional models permitted study of interferences in work flow, to establish necessary clearance between units and proper placement of auxiliaries, and to insure efficient utilization of available floor space



New layout shows advantages achieved by rearrangement. Models of old units left in original locations were aluminum painted. New and rebuilt units were natural wood. As each installation was completed, the corresponding model was painted so progress at any time could be visualized quickly

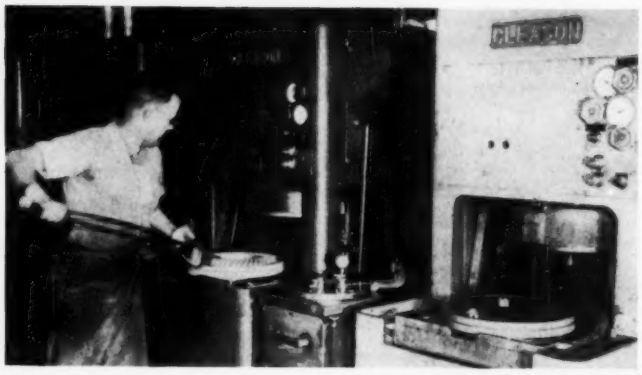
resulted in excess premium wages.

Production capacity was increased by installing equipment specifically designed to meet the needs, and arranging it to best advantage, rather than by installing additional equipment identical to that already in use. One example was the installation of two Holcroft continuous normalizing, hardening, and tempering units for miscellaneous rough-stock forgings. This permitted an increase in capacity out of all proportion to the additional floorspace. These units produce more uniform results than the replaced rotary-hearth furnaces which required temperature changes between operations. Prime labor costs were reduced considerably on the small rough forgings.

In the new layout, all rough-stock furnaces for the normalizing, hardening, and tempering operations were placed in line to give straight-through flow of work, with cleaning, inspection and straightening equipment near the discharge end. This provided an efficient flow of production parts while holding departmental inventory of parts-in-process to an absolute minimum.

Four Surface Combustion radiant-tube gas carburizers were purchased, each with 800 lb per hr gross capacity at 1700 F max. These are arranged for marquenching operations, and are equipped with special side discharge vestibules, lowerators and batch quench tanks, end discharge slot doors and internal elevators, and are designed for using two rows of trays. In addition, an old radiant-tube type furnace was rebuilt for similar operations. These furnaces do the work previously assigned to a varied assortment of box pack, muffle and radiant-tube furnaces scattered throughout the department.

The new group of carburizing furnaces are crew-operated, produce identical results and have ample capacity. Loads can be shifted from furnace to furnace whenever required. Atmosphere can be controlled closely to insure production of clean work, making it necessary only to wash the parts



Previously located in various parts of the dep't, Gleason quench presses for large bevel ring gears are now set in line behind the five radiant-tube furnaces. Gears are removed from the furnace through the discharge slot, to which they are raised by internal elevators

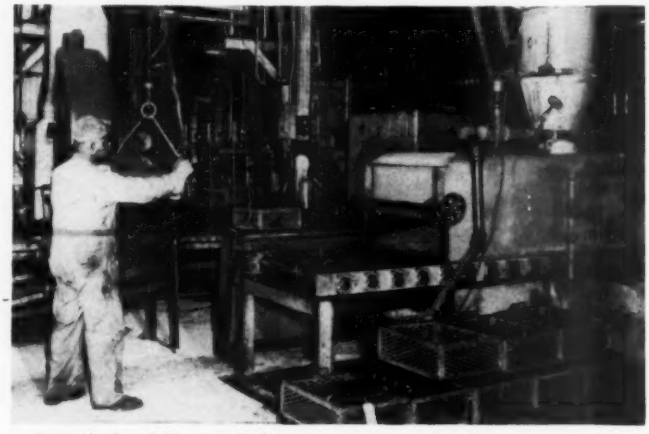
to remove quenching oil. Slow-cooled work, formerly part of the box pack furnace load, now is processed in two pit-type, atmosphere, electric retort furnaces.

Materials handling no longer is a problem—previously it was excessive, and the box pack furnaces required an elaborate conveyor and packing setup. In addition, particles of compound adhered to stock from these box furnaces, which contaminated the quenching oil and necessitated abrasive cleaning for removal. Trucking to washing and tempering equipment has been eliminated by installing a suitable power slat conveyor at the discharge end of the radiant tube furnaces.

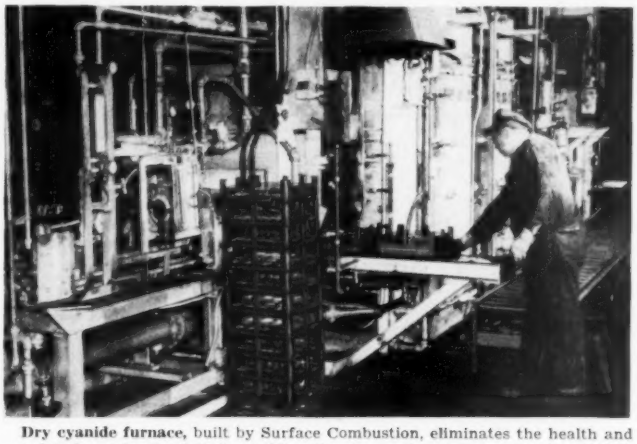
The obsolescence, rebuilding, or replacement of equipment was determined by how it blended in with the purpose of the program, the amount of repair necessary to keep it in operation, and normal operating costs. In most cases, replacement was justified on a cost-reduction basis.

Safety problems were considered carefully and all automatic safeguards available were installed. A group of operators has been trained for each shift to perform manual operations, over and above those provided by automatic devices, to prevent explosion or other damage to the equipment in the event of power, water, or gas failure.

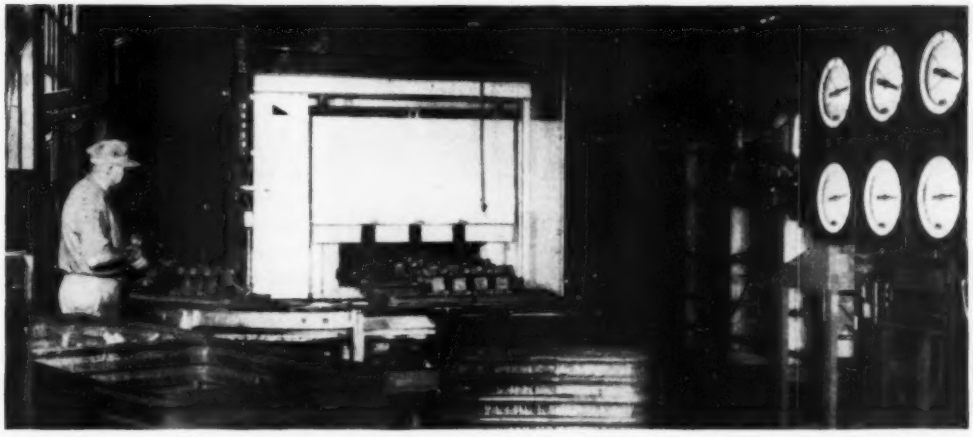
Of particular concern was the old, centrally located control instrument room. All lead wires were in a trough running the length of the department. Aside from minor difficulties, there was the constant threat of complete shutdown in event of fire in the lead-wire trough. To overcome this, it was decided to locate all instruments adjacent to the furnaces they control, and to purchase instruments that would not be af-



Carburized and Marquenched parts are delivered by slat conveyor to one of three continuous washing and tempering units. At loading end, shown, parts in baskets are placed on conveyor for trip through washer for removal of quenching oil



Dry cyanide furnace, built by Surface Combustion, eliminates the health and safety hazards of original cyanide salt pots. Pusher-type furnace has 1000 lb per hr capacity at 1500 F, and is equipped for atmosphere and oil quench. Roller conveyor returns trays to loading station



Labor costs were cut 70% on rough forgings processed in two Holcroft gas-heated, continuous, normalize, harden and temper furnaces. Each handles 1500 lb per hr and has oil and water quench tanks. These units replace several rotary-hearth furnaces

Three lines of Hagan pusher-type furnaces were rebuilt to normalize, harden and draw shafts and front axles. Three Urschel combination straightening and quenching machines size the axles before drawing. Mechanical quenching unit in foreground is for shafts

fected by vibration or atmospheric conditions.

The health hazard connected with the cyanide salt-pot furnaces previously used was considered sufficient to justify replacing these on the basis of safety, rather than of cost reduction. For this reason, a dry cyanide furnace and an induction hardening machine were purchased, and only the neutral salt pots were retained for clean hardening miscellaneous parts.

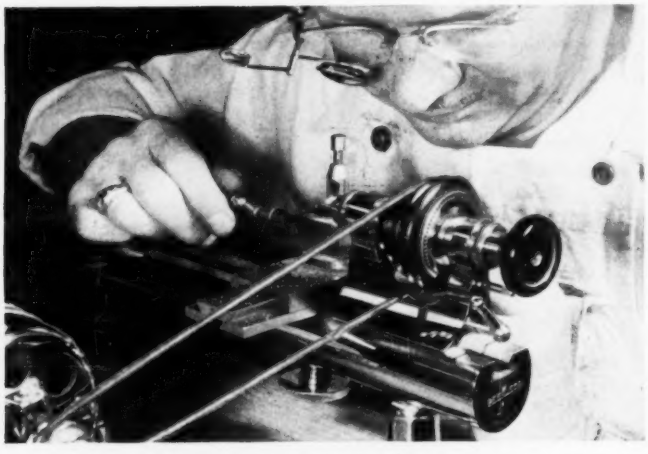
Parts leaving the new heat-treating department have been handled an average of only six times, a substantial reduction from the 14 required by the previous layout. Another saving was effected by providing enough capacity to process all parts within the plant, instead of having some treated by outside contractors.

Results now obtained have met all expectations. Stock flows through the department with unprecedented rapidity, quality is uniform, and production control is simple. The entire department has a neat, compact appearance which is indicative of its efficient operation, and is a tribute to the careful planning that covered every phase of the program. More important, however, is the noticeable reduction in over-all heat-treatment costs which are expected to pay off the entire cost of the modernization program within a short time, while promoting greater efficiency and comfort for the workers.

DUST-FREE

ONE tricky job—among others—in producing gyroscopes for guided-missile mechanisms is making air bearings—where the only lubricant in a small precision bearing is a film of trapped air, 0.001 in. thick. The air has to be forced into the bearings through capillaries that are 0.003 in. in diameter. Tough enough to machine, the bearings and capillaries are all the more difficult to produce because even a small mote of dust might scratch the surfaces or plug the holes. This kind of work is impossible in a regular machine shop under normal conditions. To make production of the bearings possible, North American Aviation moved most of the gyro production setups into a special laboratory that is kept dust-free. Mechanics wear dust-confining caps and smocks, and machines—both regular size and watchmaker's size—are kept scrupulously clean.

Nylon smock and cap keep dust under control as machinist checks width of ball-bearing assembly before it is added to gyro mechanism



Swivelling magnifying-glass assembly clamped on regular glasses has two lenses of different power for viewing work in watchmaker's lathe

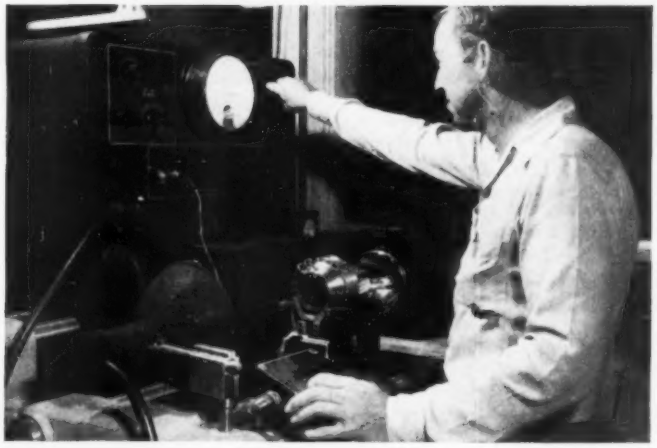
Hand lens helps observation as small orifice holes are drilled in air-bearing shell with a Bridgeport universal-head miller

"LAB" PRODUCES GYROS

American Machinist

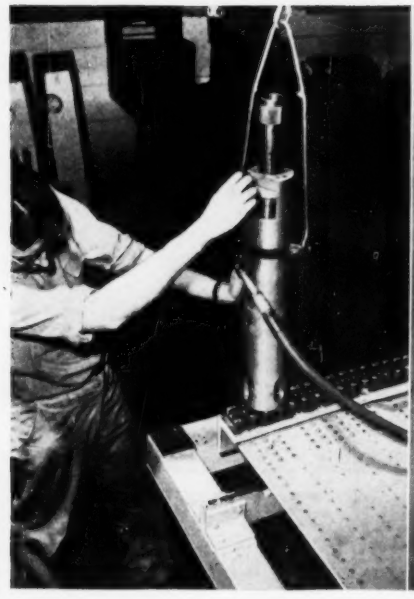
ARMAMENT REPORT

Big operation, comparatively, is generating a perfect sphere on a milling machine. Tolerance here is 0.0005 in., then lapping takes it to 0.0001 in.

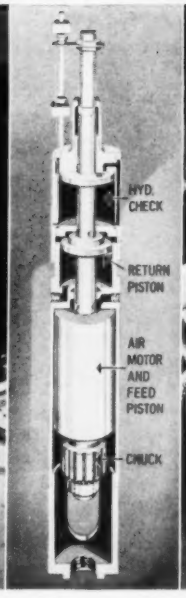


Dynamic-balance test for speeds up to 36,000 rpm is made on gyro sub-assembly. Stroboscope in rear shows "frozen-motion" conditions

Hypodermic needle is being filled with special lubricant for super-precision ball bearing. Injection is made under microscope



Held by its nose on special bushings set in a templet, a Keller Airfeedrill produces a long row of holes in an airplane center section. The operator locks the tool to the work with a bayonet catch, and turns on the power. Drill advance, feed and retraction is entirely automatic



Feed is regulated by a metering valve which permits rapid advance, feed at required rate, and automatic return when drill reaches required depth. Large piston above chuck is also the air motor, center piston is for the return, and top piston is the hydraulic check

Flange mounting holes in jet-engine afterburner are drilled with a simple indexing fixture carrying four drill units. No drillpress is required, and the entire unit is suspended from an I-beam for positioning over the work. Deep drilling is readily performed by simply reducing the feed rate

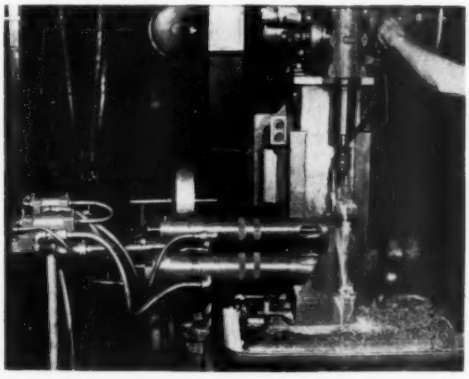
Automatic Air Drills Make Holes Faster

PORTABLE UNITS COMBINE AIR OPERATION WITH SELF-CONTAINED HYDRAULIC FEED AND RETURN

BY O. C. TOMLINSON
Works Manager, KELLER TOOL CO.

LARGE, cumbersome objects, such as airplane wings, are difficult to drill by conventional methods. One solution is an air-motor unit, like the Keller Airfeedrill, which requires no attention from the operator, other than starting and stopping. When used as a hand drill, it may be attached to the work by a bayonet lock on the nose engaging special bushings in the drill templet. Exact alignment is thus obtained at any desired angle without any manual guidance or support. For ease in moving the tool from hole to hole, it may be carried on a cable, and all the operator needs to do is to move it into position, give it a quarter turn to lock, and press the starting lever. The drill will then feed to required depth, and automatically withdraw. Speed is constant, but feed may be regulated by a simple adjustment of the control valve.

Units may also be attached permanently to fixtures and drill jigs to permit simultaneous drilling of several holes at different angles.



Mounted as outriggers on a standard drillpress, two Airfeedrills are employed to drill side holes while a vertical hole is drilled with the regular spindle. Units may also be mounted on a tapping machine so a second workpiece can be drilled or reamed while the first is being tapped

WHY WASTE WATTS?

Electric power cost is a major factor in shop operating overhead. Individual losses from small inefficiencies often go unnoticed . . . but cutting these can provide large annual savings

By WM. M. STOCKER, Jr. Assistant Editor

From interviews with:
J. W. HARPER, Machinery Div., Industrial Engrg. Divs.,
WALTER BLOOMQUIST, Industrial Power Div., Industrial Engrg. Divs.,
K. E. KJOLSETH, Industrial Heating Divs.,
R. T. GILLETTE, (Retd), Schenectady Works Lab.,
M. M. MORACK, Power Electronics Div., Industrial Engrg. Divs.,
GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

Demand peaks can hang you

POWER usually enters the plant at one centralized location. From there it is distributed by various feeders and conduits to motors, lighting, heating, welding, and plating. These five use almost 100% of the kilowatts you pay for. To analyze your plant in a practical way, it might be well to work from a layout, or even a sketch, of the plant which includes the point of power entry, each wire or cable, and each operating unit. Itemize under separate headings the equipment which runs, continually, continually during working hours, that which runs intermittently (how often?) and that which runs seldom. Identify in this table each item of equipment by type, size, and application. This combination of plant layout and electrical equipment list will provide a helpful guide to more efficient power application. Preparation alone may bring out discrepancies previously overlooked.

GENERAL SUPPLY

As purchased from the power company, most power is contracted for at a price based on three factors: total power consumed, power factor, and a demand charge. The first is the actual quantity of power used by the purchaser. If plant electrical efficiency is good this money is well spent. The other two factors are considerably less productive; added as well-deserved protection for the power supplier. But by careful electrical planning, these can be minimized to save you the extra cost and the supplier many headaches.

Ac power required by induction motors, transformers, fluorescent lights, induction heating furnaces, and resistance welders is of two kinds. These are the power-producing (working) component which is converted to useful work by the equipment and is measured in kilowatts (kw), and the magnetizing component required to produce the flux necessary to operation of induction devices. The latter is measured in kilovars (kvar). Total power is equal to the square root of the sum of the squares of both components:

$$Total\ Power = \sqrt{(kw)^2 + (kvar)^2}$$

The measurement for total power is in kilovolt-amperes (kva), or the apparent power available. The ratio of useful power (kw) to apparent power (kva) is known as power factor.

$$Power\ Factor = \frac{kw}{kva}$$

With the direction of both kw and kva flow known,

Are your electric power bills unreasonably high?
Is your present plant wiring approaching overload?
Does your power contract include a "power factor" clause?
Has sudden expansion cost you control of electrical installation?
Are you planning a new building?

Then you might find it profitable to study your present system. Look for the losses. If not to save money, then at least, as a precaution against a future power shortage such as occurred during World War II, when every kilowatt counted.

WHY WASTE WATTS? *Continued*

the following rule is helpful: The power factor is lagging when the load requires kilovars and leading if the load furnishes kilovars. Hence, induction motors have a lagging power factor as their magnetizing needs must be supplied from the power supply or other sources. Synchronous motors can supply kilovars (from the motor dc field action) so they have a leading power factor. The power factor for a mixed group of loads, when calculated, will show leads and lags cancelling each other out, but seldom to the optimum point of unity – pf = 1.0. However, the closer you come to this condition the more efficient is your use of power.

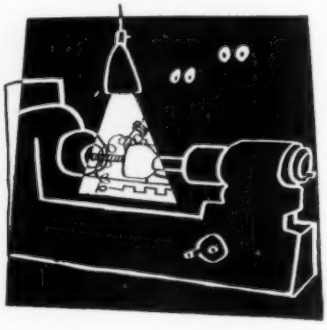
Demand is the third consideration in your contract. It is based on the highest peak load you draw at any time during the billing period; protection for the power company. If you regularly require 200 kw for normal operation, but at some time during your working period you draw 300 kw, even though for a short time, you demand ½ more capacity at the power house. The utility must provide the additional generating equipment to supply this need.

Planned balancing of power use is one of the first steps toward lower electrical costs. By keeping power factor up and turning demand peaks into lower plateaus you get the most value for your power dollar.

MOTORS & CAPACITORS

Electric motors have become so commonplace in manufacturing operations that they are largely overlooked, given maintenance only when they cease to function. An oversize motor that happens to be on hand is often used to drive equipment requiring much less power than the motor can produce. The quantity of motors in use is an indication of the enormous waste that could result if the motors are incorrectly applied and improperly maintained. Preventive maintenance, approval of installation work orders, plus careful duty selection, will avoid power waste and production losses.

Put motors where they do the most good. Operate a motor only when you need power at that point, rather than have it idling continuously to drive only once every hour. Streamline your power transmission by eliminating unnecessary high-friction items such as long shafts, belts, and complex gear arrangements. Use four 50-hp motors rather than one 200-hp motor to handle overloads better and to permit staggered starting, thus lowering peak demand. Tailor power to suit the job. Low-speed induction motors have poor power factor. High-speed motors with speed reducers are the more practical approach for slow-turning equipment. Keep brushes in good condition and commutators clean. Install the proper size of wire to carry the current drawn by the motor. Plan equipment to include individual motors for the various functions. Then only the motors for functions actually in use need be run.



Poor light is wasted power

Capacitors are comparatively new to industrial plants. These versatile power-distribution tools reduce costs, release system capacity, improve voltage levels, reduce losses, and when series connected or automatically switched, improve voltage regulation. In other words, the capacitor is a kilovar generator to improve power factor. It may be installed in an individual power circuit or in the main plant or section power supply. The latter is cheaper dollar-wise because it permits the use of a smaller unit when compared with a lot of individual capacitors. Load is handled on a more equalized basis as a result of individual motor diversity. A few synchronous motors in operation will provide additional kilovars, thus lowering the size requirement of one central capacitor.

LIGHTING AND PROCESS HEATING

Individual illumination does not require much power, but when one considers the vast quantity of lighting units in use, this factor becomes an important power-saving consideration.

Generally speaking, electric illumination is supplied by two major sources: fluorescent and incandescent lamps. These, in turn, provide three types of coverage in industrial application: high-level area lighting, specific operational spotlighting (bench, machine, etc.), and occasional illumination such as that used in storerooms, warehouses, and seldom-used corridors. Wasted power may result from insufficient illumination, from improperly applied illumination, from an inefficient source, and from carelessness in leaving lights on unnecessarily. Waste occurs whenever a light-source does not accomplish completely its intended purpose. In specific locations, *more* power may be called for than is in use at present. This is actually economy because there is a positive return on the investment.

Fluorescent lighting requires about one-half of the power drawn by incandescent sources for the same illumination level. In other words, approximately twice as much light is available for the same power dollar. Also, the light is much cooler and "softer" to employee's eyes. Although industrial lighting has swung way over in favor of fluorescent (or mercury-vapor) sources, incandescent lamps still have many practical applications. For spotlighting, fill-in lighting, portable illumination, or as an adjunct to fluorescent, it cannot be beaten. Many illumination engineers feel that a combination of 50% fluorescent and 50% incandescent lighting is most

Open door to higher bills

satisfactory for extensive area lighting. New shaped and reflector-coated incandescent bulbs are an important contribution to effective lighting as they place light exactly where it is needed.

Power savings come with:

1. Cleanliness—regular maintenance cleaning of bulbs, reflectors, fixtures, and reflective surfaces. Dirt and cutting oils can reduce effective lighting to less than half that produced.

2. Planned illumination — every lamp installed with a definite, preplanned purpose; the proper illumination for each specific job. How many individual lamps may be replaced by one large overhead fluorescent fixture? How many unnecessary fluorescent fixtures, that may be used elsewhere, are concentrated overhead to provide a light level less expensively available in individual spotlights? Become familiar with all of the equipment, attachments, and accessories which increase functional lighting efficiency.

3. Power cost-consciousness speaks for itself. Lights out when not needed, efficient use of available daylight, and such things as common sense in the distribution of occasional lighting. In large plants, power factor may be affected if large numbers of lamps are lighted at one time. This is especially important at starting time when all lamps, motors, and furnaces go on within a few minutes. Staggered starting is a practical rule where contracts contain power factor clauses.

Electric process-heating is another use of power in large quantities. Waste may be avoided by:

. . . Keeping furnace linings and insulation in good
. . . repair.
. . . Keeping temperature controllers properly adjusted.
. . . Frequent checks on thermocouple accuracy.
. . . Protecting feeder wires from dampness and insulation leakage.
. . . Planned loading of furnace to utilize maximum space
. . . Planned operation timing to avoid holding parts at heat longer than necessary.
. . . Preheating cold parts, if possible, before loading into furnace.
. . . Keeping outside building doors closed in winter to stop cold draughts.
. . . Having furnace-doors open only when necessary; closed while quenching parts.

And for induction heating:

. . . Have leads as short as possible, long leads (secondary) mean power losses.
. . . Heat only the area that requires heat.
. . . Use coils shaped to fit part as closely as possible.
. . . Set up simple interchangeable coils; suitable for numerous operations.
. . . Have power on only when heating is required.
. . . Provide proper workholders, such as jigs and fixtures.
. . . Keep equipment clean and free of dampness.
. . . High-frequency equipment usually provides greater latitude than low-frequency.
. . . Purchase reliable equipment.

Induction heating should be considered for many of the jobs now accomplished by older methods. For one thing, it offers selective heating. There is no longer any need to heat the entire part when only a small area is to be treated. In addition to saving power and time, this will also permit heat-treatment or brazing at more advanced stages of manufacture. Also, no heat-up time is necessary and, as the power is off between parts, no standby losses occur.

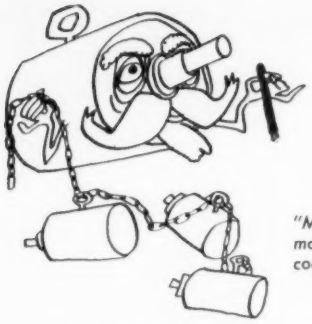
It is particularly suitable for small plants as a variety of work, both production and jobbing, may be handled with a single unit. Setup is simple and a small quantity of interchangeable coils will permit numerous operations with a minimum of tooling. However, these coils should be designed by experienced personnel as a lot of know-how is needed for efficient coil design and matching.

With proper jigs and fixtures for holding, hopper or conveyorized feeds, plus automatic power actuation and part removal, considerable production increase is possible.

RESISTANCE WELDING

Proper, well-maintained, equipment for the job at hand is the first requirement for efficient resistance welding. Specific considerations are:

. . . Properly joined connections to forestall power losses (low voltage-high current).
. . . Silver plating all contact points for maximum conductivity (secondary circuit).
. . . Direct (practical) proportion between throat depth and primary power demand. Avoid using deep-throat for small parts.
. . . Maintain relationships between part size and machine size.
. . . Select best power source. There are direct supply and stored energy methods The latter, magnetic or capacitor, provide a lesser load for a longer time. Thus a smaller cable size is required for carrying equipment and power supply. However, these units are more expensive, more complicated to maintain, and not as versatile.
. . . Three phases provide balanced load, lower peak demand, and higher power factor.
. . . Maintain cleanliness to prevent current leakage; flash across terminals. *(Next page, please)*



"Master and slave" motors are readily coordinated . . . .

. . . Eliminate leaking pipe joints and valves on air or hydraulic systems.

. . . Use proper welding procedure, proper number of welds correctly made. Often 3 good welds will hold better than 6 poor welds.

. . . Use a copper-oxide rectifier on long-throat gun welder to avoid reactance, if this is a problem. However, these rectifiers are large and expensive to install.

RECTIFIER VS MOTOR-GENERATOR

Wherever direct current is needed and alternating current is the standard supply, rectifiers may have a valuable place. They are available for many heavy industry applications, for building power supply installations, for crane power, electrochemical processes, for adjustable speed drives for many other applications, where dc power is required. Mercury-arc units are available from 75 kw upwards.

Electrochemical applications operating continuously under heavy, constant load vitally affect power costs. When this is the case, the rectifier is usually the most suitable power converter. Installation cost is low as it is a "unit" equipment and needs no special foundation. As a component it is flexible and can be packed into places where a motor-generator will not fit. Safety-wise, the rectifier is metal enclosed and contains no rotating parts. Electrically, it has a high efficiency, is instant starting, provides immediate power availability, and is easily maintained.

The rectifier always has a slightly lagging power-factor (0.955), while the mg set using a synchronous motor will usually add to and improve power-factor. If voltage control is needed, it may be supplied by retarding the firing of the excitation equipment with respect to the applied anode voltage. As much as 10% reduction in dc output voltage may be obtained by this method. When phase retard is applied, the power-factor will be decreased in approximately the percentage as the decrease in dc voltage. Adjustable voltage equipments are designed to have a 100% reduction in voltage by this method.

Rectifiers used in transportation power supply offer many advantages. Among these are simple and quick starting and stopping, minimum no-load losses (about one-third of mg set idling losses), and simple control.

Electronic dc motor drives are finding application for adjustable speed drives in industry. Wide speed range is obtained by a combination adjustable-voltage dc obtained from the rectifier and motor-field control. For continuous production-line operation there is easy coordination of "master and slave" motors, in addition to high efficiency and low no-load losses.

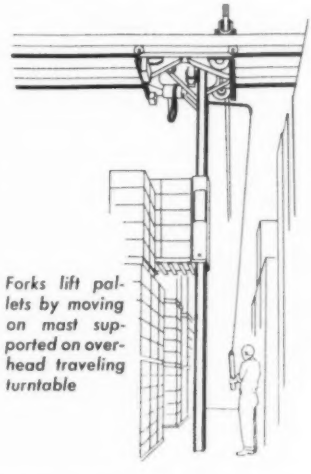
Power costs may not seem high or indicate that waste is present, but a power-cost survey of your plant may show many places for improvement—in other overhead factors as well as power.

Stacker Crane Saves Storage Space

SAVINGS in building space through the introduction of stacking cranes were cited by Fred A. Miller, E. I. du Pont de Nemours & Co., Inc., in a recent talk before the third bienniel Materials Handling Conference sponsored by Westinghouse Electric Corporation at Buffalo.

"The so-called 'stacker crane,' developed at du Pont, is an entirely new facility for materials handling. It is called a stacker crane because the stacking feature of the fork truck has simply been attached to the trolley of an overhead bridge crane. . . . This mechanical arrangement makes possible the maximum accessible storage capacity for a given area. The operating aisle width required is approximately the length of the load plus 18 in. In the case of a 4-ft pallet, the aisle required is therefore 5½ ft.

"In general, the stacker crane is applicable wherever selective and accessible storage is necessary and for special purpose propositions. . . . The stacker crane does not replace a fork-truck storage operation where material can be stowed away in large solid blocks with minimum aisle access. However, should conditions change to require immediate access to any stack, consideration of a stacker crane is recommended on the basis of greater and more economic space utilization."



Forks lift pallets by moving on mast supported on overhead traveling turntable

ROUND TABLE

'What's Next' Board

"Al, the boys have been telling me about this new chart you have posted over your desk. By darn, it's just what they said—a work pusher!"

"What do you mean, Ed? It's not a production-control gadget or anything like that. Why should the fact that I show several jobs ahead for each machine be considered pushing?"

"Well, isn't it your idea that seeing that there's work waiting will make a man work faster? That's what several of the boys think."

"They're wrong, then, Ed—or at least partly wrong. Sure, I'm trying to get work out faster, but it would be pretty hard to convince me that a 'What's Next' board would push anybody to do extra work."

"If that isn't your objective, Al, what is? There's no point in posting jobs to come for the whole shop to see unless you expect the men to do something about it."

"I do expect 'em to do something—but not what you think. My main idea is to let each fellow know that there's more work ahead and what it is—gives him a chance to get set for it in his mind and shows him, too, that he isn't working himself out of a job. Maybe, in that way they're encouraged not to worry and will get more done. But that's not pushing 'em—at least in my book."

"Haven't you felt, in the days when you really labored, that the boss was sort of laying on the pressure if he told you that as soon as you got a certain thing finished that he wanted you to get started on another?"

"Well, to be honest with you I did, Ed, but this is different—it isn't singling any particular man out and it is systematic in handing out jobs. I don't see where anybody could take exception to the idea at all."

"But they do, Al, and from my viewpoint it does away with flexibility in assignment—you might decide that Morris isn't the right fellow to handle a certain job and have to give it to somebody else—isn't there the danger that Morris'll likely object to another working out his pile of jobs?"

"If any of my men are as sensitive as that I'd like to find it out pretty quick, Ed, and wouldn't lose any time in letting them know that I was running things in my department."

"Well, I grant you the wisdom of that thought, Al, but question the advisability of intimating that you're waiting for them to finish what they're on and get going on another—looks to me like a lead-extracting scheme, if you get what I mean."

***WOULD A 'WHAT'S NEXT' BOARD** help in the average shop? Have you seen any similar system? What do you think of this idea? Other readers will be interested. Discussion of earlier topics appear on later pages*

BAND SAWS CAN CUT BLANK COSTS

Contoured blanks, even in lots as large as 5000 pieces, may be produced at lower cost by band machining than by the cheapest press tools

By H. J. CHAMBERLAND, Research Engineer, THE DOALL COMPANY

Cutting operation on an 18-sheet stack of 12-gage, specially coated mild steel sheet at 1¾ ipm. Position of clamps is easily changed to clear passage for the saw without disturbing the stack

PRODUCTION of parts in limited quantities becomes a more serious problem every day. This is particularly true with metal stampings because the term "short run" can apply to so few pieces and yet to a great many units. This article is not concerned with high-volume, conventional press production, nor with runs of substantial volume that can be diverted to short-run press tools or shuttle-actuated press setups with absolute certainty as to favorable outcome. The objective here is to establish a stop line where so-called floating-punch blanking systems must yield to simpler methods to reduce unit cost.

Ten years ago, it was definitely determined that as many as 20,000 plain stampings could be produced at approximately the same unit cost by either die method. On the other hand, it was also determined that thin-die cost per unit gradually declined as runs got shorter, with the conventional die, of course, working in reverse. Because the cost of thin dies and punches, often made from cold-rolled steel, was only 25%, or less, of that of conventional tools, it was not unusual to consider the former for lots of 50 or 75 units.

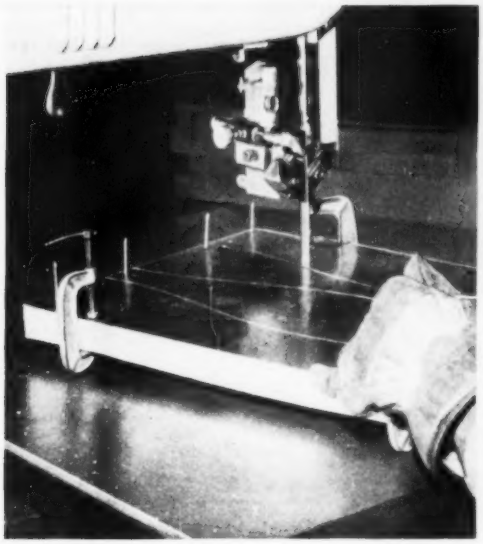
Today, with rising labor costs and decreasing productivity, it is obvious that any so-called thin die or floating punch process has become impractical, if not obsolete, for considerably higher runs than the maximum of a decade ago. Taking these factors into account and realizing that the thin die is only one-third as productive as the conventional die set, die cost per unit should be predetermined quite closely. If these figures don't make sense, the alternative may lie in some dieless procedure; and stack cutting by the band method deserves consideration.

In recent years, considerable research has been in progress to determine figures on thin-die versus stack-cutting costs. For more precise conclusions, a conventional die was also brought into the picture. Based on a $200, high-volume press die and a $38 shuttle-actuated die, repeated tests proved that the band method was as economical as the former for runs of 2500 units and even more economical than the latter for runs of 800 units. Therefore, except for the small labor cost involved in preparing the stacks, this economy can well be stretched, and many plants do not hesitate to stack saw 5000 and more units of any one design.

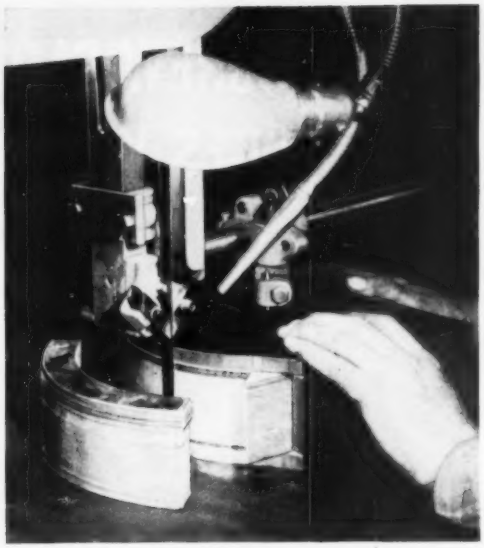
There are various ways to prepare stacks for sawing. Clamps are most practical for stacks within a reasonable height, but stacks built up to the full height capacity of the machine may be cut if bead-welded under pressure at the corners and at least one location on the sides. This applies to cold-rolled steel, not to stainless, copper-base alloys or aluminum. Small stacks are preferably soldered, rather than welded.

When parts are segmentally shaped, they can be cut most efficiently with a fixture, making use of a circular cutting attachment on the machine for accurate duplication of cut. It is, of course, understood that blanks must be shear cut uniformly for all stack-sawing applications, particularly for welding or soldering, or for use in a fixture to provide free movement of the stack.

Cutting rates necessarily vary with the height of stack, complexity of outline and nature of ma-



Hot-rolled sheets, 1/32 in. thick, stacked 75 high, are cut at ¾ ipm. Small pins maintain alignment when moving clamps. If these are objectionable, more clamps should be used and care taken in changing their positions

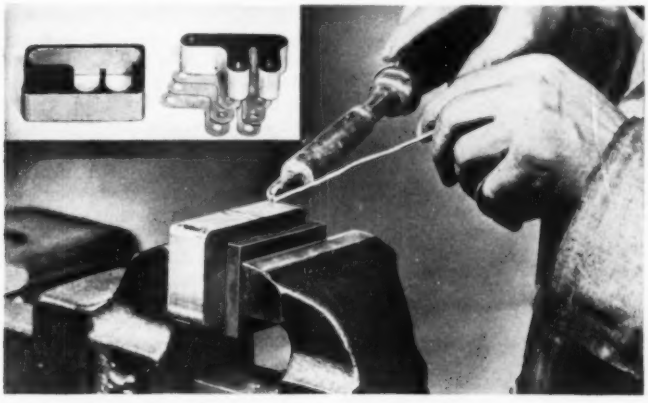


Band machining fixture for cutting segments by means of a circular cutting attachment. Work is fed through the fixture after each cut. Even glass can be cut when a silicon-carbide edge is used on the band

terial. Assuming that the material is cheap steel, the stack is 6 in. high, and the outline does not involve a radius smaller than 4 in., a lineal cutting rate of at least ¼ ipm is possible, provided the band is of the precision type or specifically heat treated for such operations. If the stock were 1/16 in., the length of cut 25 in. and operating cost is estimated at $2 per hr, which is normal, cost per unit would be approximately 3.5¢. On the other hand, even though thin-die cost could be held down to $20 and operating cost at $3.50 per hr, blanking cost per unit would be about 25¢. This is based on a production rate of 100 blanks per hr, which may be considered as about normal for a run as short as 96 pieces. Thus it is apparent that at least 500 pieces could be band machined for the total thin die cost, allowing a fair provision for laying out and preparing the stacks.

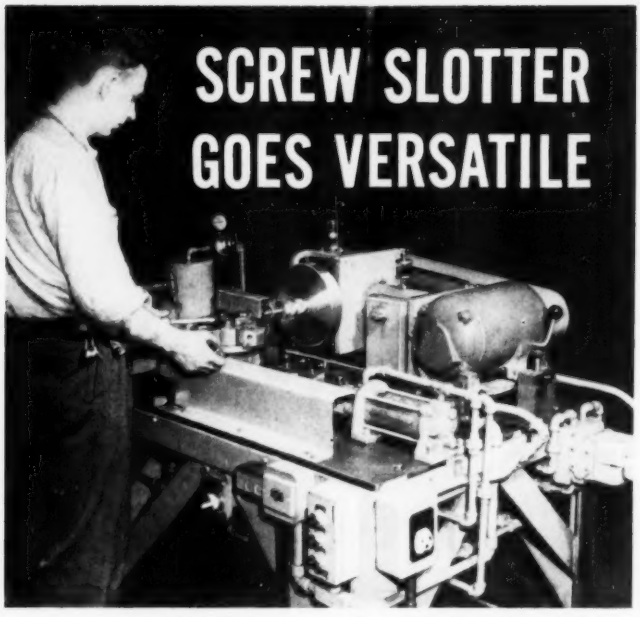
Stainless sheets will not respond so easily to stack cutting, and time will be saved by limiting the cutting height to 3 in. max. A cutting rate of ⅛ ipm is possible on this material thickness, but saw life will be much shorter than when cutting soft steels. No trouble should be anticipated with brass or copper sheet, if proper saw control factors are given attention.

With aluminum sheet, high speeds enter the picture. The buttress type of band is highly recommended for this purpose, and velocities may vary from 2500 to 3500 fpm, depending on thickness of stack. There is, however, one drawback in this instance: With sheets under ⅛ in. thick there is a tendency toward chip welding, and the stack should therefore be limited to 30, or preferably 25 sheets. Normal feeding pressure should also be considerably reduced to help prevent this welding action.

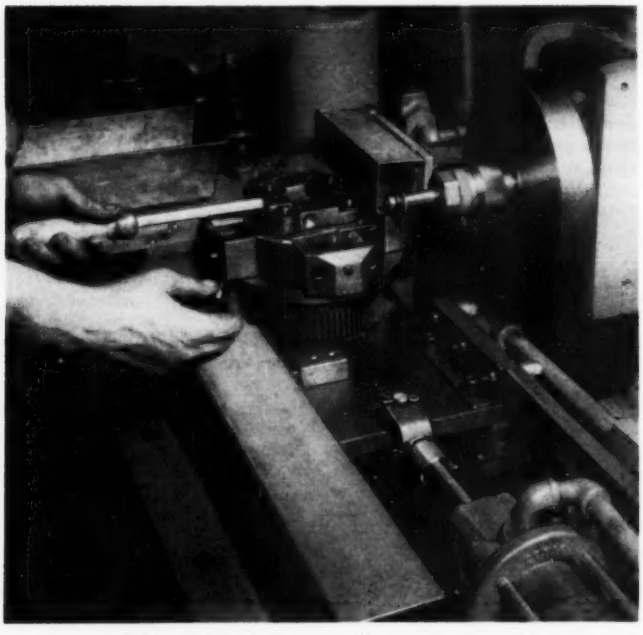


Small stacks may be soldered together for internal or external sawing. This method is suitable for stacks up to 15 in. square. For larger work, welding is preferred. Insert shows 50 switch parts cut out simultaneously from scrap material

SCREW SLOTTER GOES VERSATILE



Hanna-built slotter is on a husky metal table. Cutter spindle is on tiltable support to clear work on return stroke. Power from motor is through Lima drive and V-belts



Only hand job is when operator forces push rod against lever to open chuck, allowing loading and unloading of screws. Cylinder at right moves main slide

Not everyone has screw heads to slot in large quantities, but the pneumatic and hydraulic hookups on this special machine point up possibilities for other jobs. The shop-designed rig operates automatically, continuously, and economically

BY CHESTER KAZEK, Sr.
Chief Tool Engineer
HANNA ENGINEERING WKS.

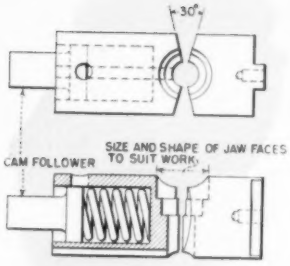
SPECIAL SCREWS—like shafts for needle valves—must be slotted so they can be easily adjusted. This particular job can be a constant source of annoyance and trouble; or it can be a simple operation performed on a machine ideally suited for the work. Engineers at Hanna Engineering Works made it simple by designing and building a specialized rig on a steel workbench.

The mechanism has four small chucks with replaceable jaws that hold the work vertically. The chucks are 90° apart on a round indexing table, and the table is supported on a simple reciprocating plate slide. Each chuck passes under the cutter in turn while the operator is reloading another chuck on the station near him.

On the drawings, the cycle works out like this:

The table starts at the far left. After it is indexed, an air cylinder (1) pulls it at rapid-traverse speed toward the right. When the work is close to the cutter, a cam on the slide hits a valve lever which admits oil to the check cylinder (2). This slows the slide to a normal cutting feed. When the work clears the cutter, a second cam on the slide hits another valve lever to release the check cylinder.

At about the same time, table dogs on the slide hit two precision switches in succession. The first operates a four-way solenoid valve that powers the rack cylinder (3)



Special jaws to fit any product can be machined and inserted in the four chucks of the slotter

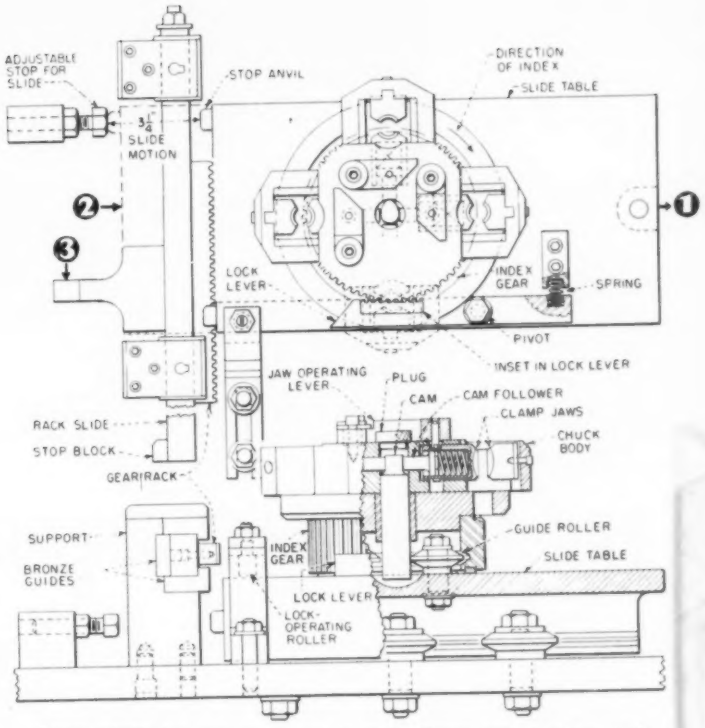
to reverse the indexing rack. This gets back into position to index the table. The second switch operates another solenoid to reverse motion of the table.

As the table moves back to the left, the slanted end of the lock lever hits a stationary roller and is pivoted out against spring pressure. The gear sector in the lever is thus pulled out of engagement with the index gear to release the gear so it can be indexed.

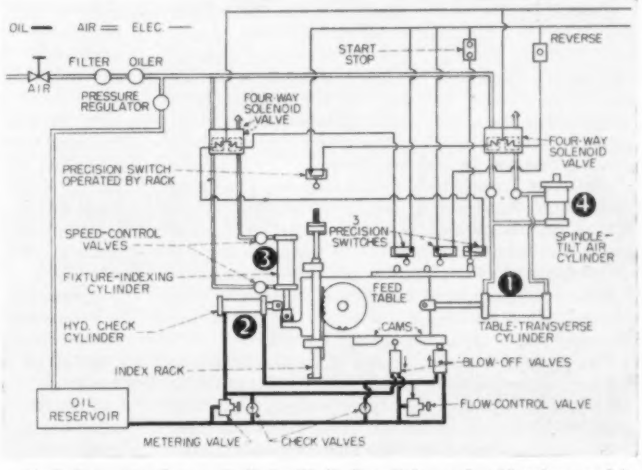
When the table is back to far left, the index gear comes into engagement with the indexing rack. A third precision switch on the slide then trips another solenoid to activate the air cylinder (3) that pulls the rack back, rotating the index gear. When the rack reaches the end of its motion, an adjustable stop on its end hits another switch that starts the air cylinder (1) to move the slide to the right again.

The rocking frame of the cutter is controlled by an air cylinder (4) that is coupled with the cylinder (1) which moves the slide. This pulls the frame down to put the cutter in machining position when the slide moves to the right, and lifts the spindle so the cutter clears the work on the return stroke.

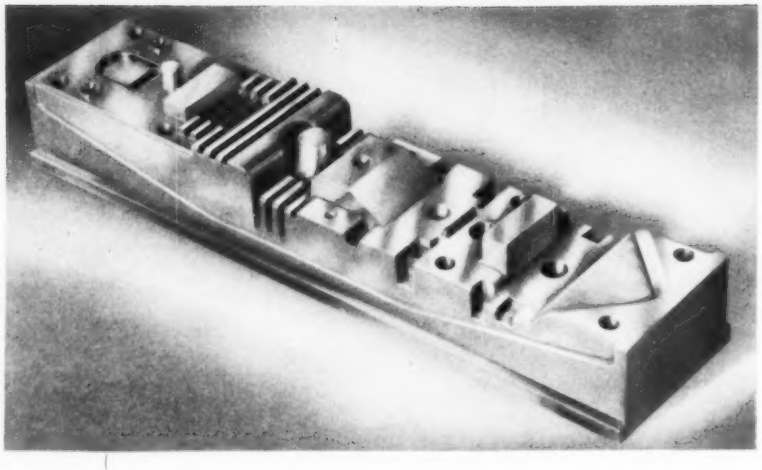
The complete system has suitable flow-control valves, check valves, and speed-control valves so the cycle can be adjusted for perfect synchronization.



Center spindle has cam on top end to push follower against spring. This extra pressure clamps chuck extra tight during cutting. Spring-loaded lock lever holds index gear steady except when slide travels to left. Roller supported from base then trips slanted end of lever to release gear so it can be indexed by air-shifted rack



Cycle is progressive, controlled with limit switches, solenoid valves, and table stops. Air cylinders push and pull slide, index table, and tilt spindle head. Oil cylinder checks cutting stroke of slide



Plastic mold for a part requiring close tolerances. Steel for such a mold requires high compressive strength, low movement in hardening, easy machinability, and must hold a high polish

TWO STEELS MAKE OUR PLASTIC MOLDS

Tests at Westinghouse cut mold-steel types to two for all requirements. Molds are improved, heat-treating problems simplified, and cost reduced

By R. W. BROWN, METALLURGICAL ENGINEER
Materials Engineering Dept., WESTINGHOUSE ELECTRIC CORP.

LIKE OTHER plastic molders, the Westinghouse Electric Corp. has long been confronted with the perplexing problem of what steel to use for mold cavities. In spite of the many years of experience with this problem, considerable disagreement existed until recently among the designers, mold makers, and metallurgists as to the proper steel for a specific application. Today, however, the situation has been simplified to the extent that only two steels are carried in stock for mold cavities—one for machined cavities and one for hubbed cavities.

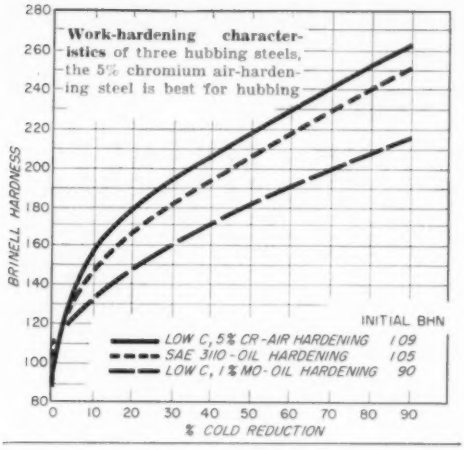
Materials from which molds may be fabricated range from ingot iron to highly alloyed tool steels. SAE 1020, often known as machine steel, was one of the earliest and most-used cavity materials because of its widespread availability and easy machinability. However, this steel has serious drawbacks with regard to heat-treating distortion as it requires carburizing and a brine quench for hardening.

The alloy carburizing grades of the oil-hardening type comprise the bulk of the steel now used in the plastic-mold industry. Analyses include SAE 3312, 3120, 4615, and many others. These steels are more difficult to machine than SAE 1020, but their greater hardenability and lessened heat-treating distortion have insured their popularity. For complex molds requiring close tolerances, however, none of the oil-hardening types can achieve the dimensional stability of the air-hardening steels.

Oil-hardening tool steels are used by many mold makers. These types have the advantage of good compressive strength and fairly low movement in hardening. They are, however, quite notch sensitive and their use for uneven sections is limited.

Because most of our molded parts are close-tolerance structural components, the problem of heat-treating distortion has been a major factor in the evolution of the all-purpose steel for machined molds. From the standpoint of physical properties, SAE 3335 was found to be suitable, but this analysis is essentially oil-hardening and thus subject to the vagaries of liquid quenching. However, the addition of 0.25% molybdenum produces air-hardening properties in this composition, thus providing what is considered to be the ideal compromise for a machined mold material. This steel will harden throughout to 52-55 Rc with an air cool. Greater hardness can be obtained by carburizing.

The use of the Ammogas furnace has been quite effective in extending the possibilities of the air-hardening steels. Using an atmosphere of either dissociated ammonia or hydrogen in conjunction with a cooling chamber, this furnace makes possible absolute bright hardening.


Work-hardening characteristics of three hubbing steels, the 5% chromium air-hardening steel is best for hubbing
BRINELL HARDNESS
% COLD REDUCTION
INITIAL BHN
LOW C, 5% CR-AIR HARDENING 109
SAE 3110-OIL HARDENING 105
LOW C, 1% MO-OIL HARDENING 90

When desired, carburizing is accomplished by the introduction of a small quantity of methane. By this means, polishing necessary after heat-treatment is minimized to that required for correction of slight dimensional changes.

The properties desired in a hubbing steel include high ductibility, low rate of work hardening, and satisfactory carburizing and hardening. Ingot iron (JIC P1), widely used for hubbed cavities, possesses the first two of these properties to a high degree, making it the most easily hubbed of any ferrous material. However, its erratic carburizing characteristics make it unsuitable for any but relatively simple molds. Core hardness is also quite low, making it unsuitable for heavy molding pressures.

Several oil-hardening hubbing steels are available with varying alloy contents. SAE 3110 is quite popular, as is a low-carbon, 1.0% molybdenum grade. Because the addition of alloys reduces the ductility and increases the work-hardening rate, these steels require greater pressure to hub a given depth than does ingot iron. These grades are readily carburized to the required depth, but they require liquid quenching with its problems of distortion.

There has been a great reluctance to attempt the development of an air-hardening hubbing steel since a cursory glance at the situation seems to indicate that sufficient alloying for this purpose would necessarily mean extreme hubbing pressures. However, by choosing those alloying elements which are high in effect on hardenability and low in effect on ferrite hardness, an air-hardening analysis is feasible which is actually easier to hub than some of the oil-hardening varieties. The nominal composition of the grade found to be suitable by Westinghouse is: 0.07 max. carbon, 0.20 to 0.40 manganese, 0.40 to 0.60 molybdenum, 4.5 to 5.0 chromium. This is similar to JIC No. P-4.

This air-hardening grade may be heat-treated by carburizing at 1760 F followed by air cooling and tempering at 480 F. The resulting hardness is 57 to 58 Rc on the case and 25 to 30 Rc in the core. The Ammogas furnace may be used on this material, a case of 1/16 in. being produced in 4 hr at 1760 F.

A simple test determines the work-hardening characteristics of the hubbing steels. The method consists of cold-reducing a bar ⅜ x 1¼ x 6 in. in increments of 5% and checking hardness after each reduction. A curve of hardness versus percent reduction is then plotted as shown. This chart presents data on SAE 3110, the low-carbon, 1% molybdenum grade, and the low-carbon, 5% chromium, air-hardening material. The superiority of air-hardening steel is amply demonstrated by the decrease in the slope of the work-hardening curve displayed in spite of its slightly increased annealed hardness.

By use of these two air-hardening steels, Westinghouse has been able to produce better molds at lower cost. Multiplicity of materials and treatments formerly required has been eliminated, with a reduction in material inventory. Reproducible results in hardening have become commonplace, and molds are not cracked in heat treating.

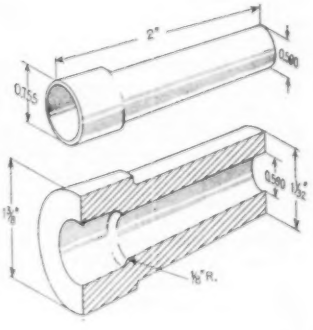
As all molders' problems are different, we do not infer that our system is a panacea for the industry. However, by a similar program, almost any molder can benefit by reducing the number of materials and working with the best available.

CARBIDE FLARING DIE CUTS DOWNTIME

Kennametal, Inc. reports that a flaring die, originally made of steel, produced 250,000 5/8-in. tubes when made in carbide—an increase in die life of 550%. Although the steel die cost only about $70 to make, and the carbide (Grade K3H) cost about $150, the shop that used the die reported that $3700 and 89 hr in downtime for polishing were saved.

Downtime on both steel and carbide dies was 15 min for each polish, but the steel die produced 700 pieces per polish, while the carbide turned out 10,000. Steel-die life was about 5000 pieces; yet the carbide die flared 275,000 tubes up to the date of the report.

Die cost, at the rate of replacement for steel dies, would have been $3850 for this number of finished parts; but the actual cost for the carbide die was $148.75.



Stock Enough for cleanup . . .
No individual layout . . .
Castings qualified at the foundry . . .
Initial machining speeded . . .
Scrap minimized, when . . .

TARGETING FIXTURES

BY ERIC PREECE, Works Manager, Fairchild Engine Division, FAIRCHILD ENGINE AND AIRPLANE CORP., FARMINGDALE, N. Y.

Mass production, defined, might be: Routine repetitive production with a minimum application of the human element, and interchangeability achieved by accuracy in the finished part. Apply this definition to the large, closely toleranced, castings required in modern turbo-jet engines and obvious difficulties will arise. Nevertheless, mass production is being attained on aluminum-alloy 37-in.-dia castings having as many as 300 holes and 48 bosses, with pads machined to tolerances as close as ±0.001 in.

One factor which permits true mass production of such castings is the extensive use of "casting qualifying." Sand casting such as the midframe of the General Electric J47 turbo-jet engine are held by the foundry to tolerances as close as ±0.030 in. However, dimensional errors and other faults occasionally creep in.

Qualifying (targeting) fixtures therefore, are used to:

1. Check casting equipment at the foundry by checking a first "green," and then subsequent castings.

2. Establish positive locating points, prior to any machining operations in the machine shop.

As all targets on the qualifying fixture show profiles and critical areas within given tolerances, discrepancies such as core shifts and errors in pattern dimensions are revealed immediately if the first green casting from each set of pattern equipment is checked in the qualifying fixture each day. If faulty foundry practice or defective casting equipment is indicated, steps can be taken to correct the trouble before the output reaches expensive volume.

Prior to establishment of the qualifying program, casting layout, was the first operation in the machine line. A first class layout man equipped with a surface plate, height gages, numerous parallels, and screw jacks, checked for dimensional errors and to scribe new lines on the casting, by which adjustment of the casting was made in the machine line.

Dimensional variations were disclosed, to some extent, but it remained imperative that the casting be adjusted to divide discrepancies as accurately as possible among the machines on the first few operations performed by first-class operators. Investigation indicated that greater accuracy and more thoroughness could be obtained by using a qualifying fixture. It was also found that semi-skilled personnel could do these primary operations, thus relieving skilled personnel. Simplification or elimination of machine setup procedure was mainly responsible.

Qualifying fixtures will prove the configuration of the casting within usable limits and eliminate the common controversies between machine-shop and foundry personnel as to responsibility for castings which do not "clean up." Every foreman, foundryman, and machinist who has worked on castings has had that experience.

The cost of qualifying fixtures, in many cases, will exceed the cost of standard layout equipment. However, qualifying fixtures do prevent sub-standard or defective castings from entering the manufacturing line, thus saving the cost of machining them before their faults are discovered.

Above all measurable and more tangible factors remains the most important element, *quality*. The quality of finished parts made from qualified castings is definitely superior. Comments and memoranda from machine-line supervision, inspection results, and the general appearance of matched assemblies bear this out continually.

Casting qualifying can be considered an integral factor in mass production. A higher degree of foundry efficiency is obtained as a result of casting qualifying and the cost of the rough castings can be held to a minimum by doing this at the foundry.

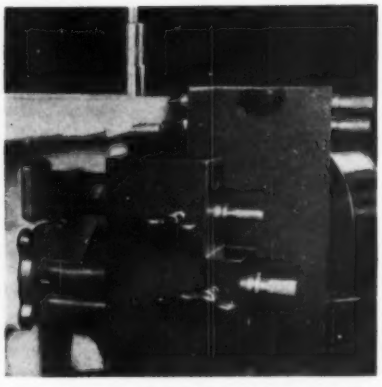
Number One in setting up a casting qualifying program is to determine where the practice can be used advantageously, such as, by analyzing all scrap tickets issued on scrapped castings. Inspection describes in detail, on the scrap ticket, the location and variation of the dimensional error attributable to foundry practice that caused the rejection of the part. Even after a qualifying program has been set up, continued analysis of scrap tickets will reveal other castings that should be added to the program, as well as indicate

HOW CASTING QUALIFYING SAVES MONEY

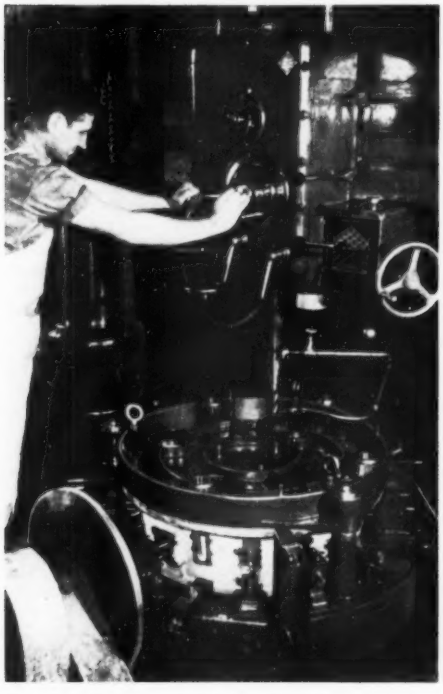
1. **Removal of dimensionally inaccurate castings at the foundry by routine spot checks**
2. **Elimination of bad castings from the machine lines before any machining is done**
3. **More accurate yet less costly operation**
4. **Lower handling requirements**
5. **More uniform quality in the finished pieces**
6. **Elimination of controversy between foundry and machine shop over responsibility for castings which do not clean up.**
7. **Less scrap because *all* castings started must have sufficient material for all machining operations**

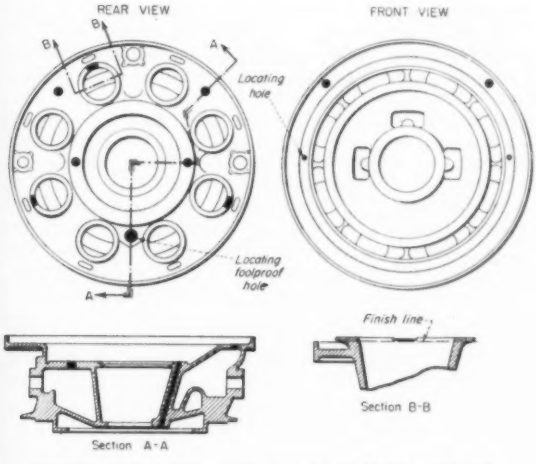
BOOST CASTING OUTPUT

Casting qualifying fixture (top removed) was developed for use with the aluminum alloy midframe casting in the General Electric J47 engine. Devised by Fairchild Engine Division, it minimizes the element of human error created by surface plate checking, assures speedy and certain detection of dimensional error, and simultaneously positions the rough casting for accurate machining



Cone points and flush-pins tell the story. The former (top center) indicate the quantity of material to be removed from the periphery. Pad positions are checked by the flush pins. The amount of stock for machining is indicated by the distance the pins protrude from the mounting block, measured to the collar shoulder





Complex hole location would present a difficult layout problem for each casting. With the qualifying fixture, this operation is reduced to simply positioning and production drilling. The trunnion-mounted, motor-driven fixture makes it possible to drill 13 holes while the casting is still in the original unit. It turns completely around the trunnion axis. Two extra index stations permit drilling of two angular holes

CONTINUED ON NEXT PAGE

Tools and gages used for setting up and machining the casting in the fixture are arranged on a table within the reach of the operator. Thus, even minor details are planned for work simplification; add to saving

improvements and additions to the inspection technique for those castings being qualified. Scrap tickets are not the only indicator, but they are one of the more positive and convenient means of defining casting-qualifying requisites.

If, for example, the scrap tickets on a particular part show a certain machined surface consistently failing to clean up, this would be a definite indication that a gaging operation is necessary in the qualifying fixture to check and adjust, if possible, the relative location of this surface to assure sufficient machining stock. If, for another example, scrap tickets showed that a boring operation through a boss was consistently off-center in relation to the boss, it would be advantageous to add a target to the fixture which would check and adjust the relative location of this boss with the other machined and locating surfaces.

After determining which castings are to be qualified, the next step is the design and procurement of qualifying fixtures. These fixtures are designed to locate the rough casting from points which are constant. The casting is then shifted to equalize dimensional variations, by comparison or matching with critically located targets on the fixture. When the casting is correctly targeted in the qualifying fixture, sufficient stock for machining is assured as all targets are provided with a minimum and maximum gaging step at the back of each guide pin. In addition, flush-pin gages, each with a conical contact point, are provided to show at a glance the amount of stock to be removed in machining.

The flush-pin gage arrangement permits casting adjustment as accurate as required. Large hard screws permit easy adjusting and shifting of the casting. Locating points are machined on the casting while in this correctly targeted position. These spots or holes are located to close tolerances by means of bushings in the qualifying fixture. Locating points are always in direct relation to the targets, hence, will always fall at the same position on all castings. Each locating spotface depth is controlled by a shouldered stop bushing and is gaged with a flush-pin depth gage. Large openings have been provided in the fixture to expose casting contours as much as possible for quick and easy targeting. Spotfacing tools have adjustable collars for adjustment to proper depth after sharpening.

In addition to two large angular holes, some 11 other holes are drilled, reamed and spotfaced while the casting is in the qualifying fixture. Utmost accuracy in positioning of these holes is thus assured. Use of the qualifying fixture for the initial machining operations permits sizable reductions in handling costs and machine loading time as for this size of casting, handling is expensive.

One master casting is held by the Inspection Department to be used periodically in the qualifying fixture as a standard to determine that targets, locating points and machined surfaces are in accordance with the tool drawing. Thus, consistent quality is assured. One or more of these qualifying fixtures will be maintained for each casting qualified according to machine-line and schedule requirements. Thus, when the locating buttons, stops, or locating dowels in the follow-up machines are set to the same relative dimensions as the locating points machined in the qualifying fixtures, the casting will be in the same correct position in each machine as in the qualifying fixture. Consequently, all profiles, bosses, and planes are in proper relation to each other as specified on the finished-part drawing. Machining is performed without manipulation or adjustment of the casting in the machine line.

The experience of the Fairchild Engine Division has proved that this procedure offers many advantages over the previous conventional practices whenever the production quantity is sufficiently large to justify the designing and manufacturing of qualifying fixtures. However, the castings must be of sufficient complexity to warrant accurate checking.

Tips FOR TOP SHOP MEN

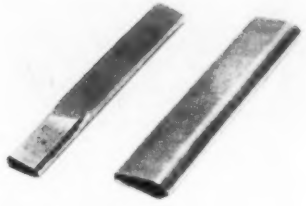
373 Watch always for the jobs you *can't* do—well. Specialized equipment and specialized knowledge outside may be worth the extra cost in reduced scrap and headaches. Sometimes the price may be less too—and it costs nothing to get an estimate.

374 Be sure your machine tools don't spend most of their "working" day as layout tables. A machine tool earns its keep only when it is cutting metal. Jobs can be set up on a surface plate or bench by someone else—frequently someone better at setup than the machine operator.

375 Microstructure, rather than composition, may frequently be the key to successful machining of a part. Two pieces that look alike and were made alike may be entirely different in their reaction to a tool.

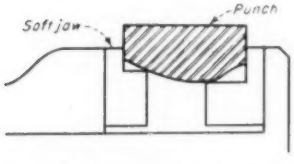
Practical Ideas

Precise Methods Make Punches With No Expensive Equipment



IDENTICAL PUNCHES in two sizes were required for cutting winding holes in laminations for fractional-horsepower motors. These had to be made to close tolerances so the laminations would not damage the motor-winding insulation. Without special equipment for the job, this turned out to be a problem in setup.

The illustrated punches were made by starting off with blanks that were shaped and ground to 3x0.503x0.1905 in., square and parallel. Then two soft jaws were made for a milling vise, and a piece of ½-in. stock was clamped. A slot



was milled across the jaws and ½-in. stock to produce a step in each jaw that was about half as deep as the cut to be taken on the punches.

Next, a setup was made with a punch clamped between the steps in the vise jaws. The punch was covered with layout dye, indicated on all exposed surfaces to get it square to the machine spindle, and a line was scribed across the vise screw and trunnion so the vise could be clamped to the same pressure each time a new punch was gripped.

Cutters were made by crush-dressing a wheel with a roll made accurately to the profile shape wanted. The same wheel that ground the punches ground the die sections, so errors were cancelled.

With a punch blank clamped in the vise, a cut was taken with the cutter to a depth that left only a slight line at the thick edge of the punch. The blank was removed from the vise and checked with sine bar and measuring wires, and suitable corrections in setup were made by adding shims under the vise jaws and taking cuts on the jaws.

All punches of the same size were milled on one side to final dimensions before the setup was torn down. This insured identical punches.

A new set of jaws were made with different steps for the reverse setup. Punches were clamped as before, with the ends of each punch square against the vise jaws and with vise pressure even throughout the batch.

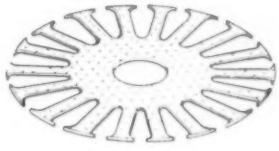
When finished, each punch was milled exactly 0.003 in. oversize, and when run into the dies, the punches sheared to size with equal burr produced on all surfaces. After hardening and grinding, each punch was hand-fitted into the same die opening it had been sheared into. *W. S. Gilbert, Bridgeport, O.*

Thread Knurling Simplifies Assembly of Products

HERE IS AN idea that has proven to be practical, although it will probably sound like a crackpot scheme to many shop men. It is used in making threads to wide tolerances, and allows good interchangeable assembly after the threads have been cut.

The idea is to knurl threads after they have been cut. We first tried out the method when cutting a number of long ¼-in. rods that were to be threaded at both ends; both with Whitworth and National Fine threads. These rods acted as pitmans for treadle sewing machines for household use, and had to be assembled to ball bearings after being machined.

The procedure we worked out was to thread the rods a little farther than necessary, then run a traversing knurling tool over the completed thread. We have found that accuracy in cutting the thread can be reduced somewhat, and final size of the thread can be controlled by controlling the pressure of the knurling tool. Even if the knurling is heavy, the nut or bearing will thread onto it because the knurled spaces allow free flow of oil, which prevents binding. *Cecil Turner, Sydney, Australia.*

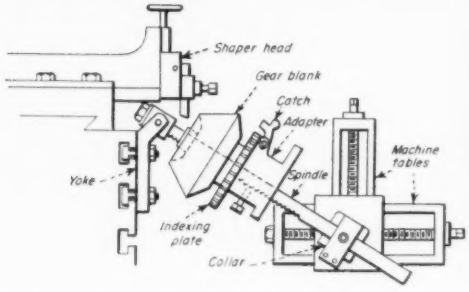


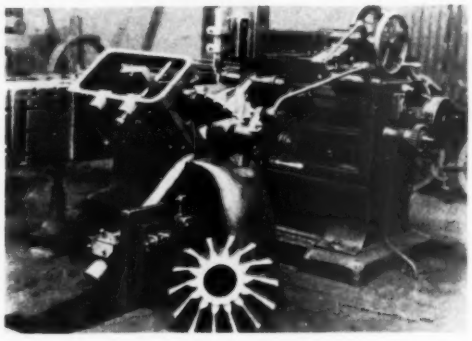
Dimpling Keeps Blanks From Sticking

SOFT-STEEL ARMATURE blanks, when stacked together in piles for annealing, tend to stick together. This will increase handling time quite a bit unless something can be done to keep them from holding to each other. We manage this by dinking the surface of each armature with a swaging die.

Dimples are about 0.080 in. apart, in a square pattern, and are 0.005 in. deep. These minor projections, spread all over the surface of a blank, make sticking impossible. A byproduct advantage of the process is the flattening effect the dimpling has on the blanks. The swaging operation forces out all warp in the blanks. *F. E. Adams, Dayton, O.*

Shaper Makes Gear Cutter



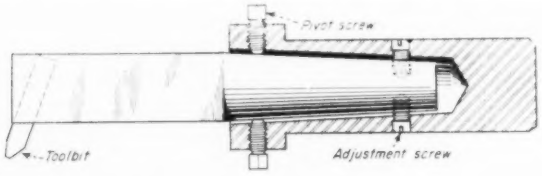


STRAIGHT AND BEVEL gears of many types have been made with this adaptation of a conventional shaper, using a special fixture for holding the gear blank. Although the rig looks clumsy, it is actually quite efficient and usable.

The shaper was fitted out by first digging a pit in front of it to admit the adjusting slides that position the spindle on which the gear is clamped. One end of this spindle is pivoted on a yoke fixed to the machine table — under the shaper head. A section of straight rack was fixed to the under side of the spindle to allow keying the gear holder at any position along the spindle. The lower end of the spindle is carried by a split collar that is moved up and down as well as back and forth by two table feeds that were salvaged from old machines.

Each gear to be cut is first keyed to an adapter that slips on the long spindle. Behind the gear is located an indexing plate, controlled by a swiveling dog on the adapter. When the gear has been set up on on the spindle, the spindle is aligned at the required angle to the stroke of the ram by adjusting both feeds—vertical and horizontal.

Cutting is done with a heavily braced toolholder clamped in the ram head. As cutting progresses, adjustments can be made at the ram head and at the two machine feed wheels. Normally the gear is indexed around after each pass until a cut has been made completely around the gear profile. An arrangement, as shown in the photo, was made to index the gear automatically after each stroke of the ram. This makes the operation self-sustaining until the toolbit position must be adjusted for a deeper cut. *Justo P. Ramirez A., Tocopilla, Chile.*



Boring Bar Pivots on Setscrews

THIS LITTLE boring tool is useful for an automatic lathe or turret lathe because it has a minimum overhang and is quite rigid, yet is easy to adjust. Two pointed setscrews through the walls of the drilled and tapered shank position the rear end of the toolholder.

The toolholding bar is a simple shaft, broached out at the front end for the tool, and tapered along the rear end so it can shift inside the shank. The holder is pivoted on two setscrews through the head of the shank. These nest in recesses in the holder, as shown in the sketch.

It is important to harden the ends of the two pointed setscrews and also to heat-treat the rear end of the toolholder where drill spots are located to nest the ends of the screws. With the illustrated model, adjustments can be made vertically. If horizontal adjustment is desired, one set of setscrews should be moved 90° so the pivoting setscrews are in a vertical plane and the adjusting setscrews are in a horizontal plane. *Neville Palmer, Paddington, Australia.*

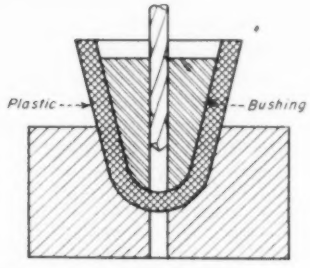
Clearance for Die Parts Dressed on Grinding Wheel

AFTER A PUNCH or stake has been fitted or sheared in, the clearance can be accurately and easily ground by dressing it on the grinding wheel.

The wheel is first dressed square for the final cutting passes, then a notch at one edge is dressed back by the amount of clearance.

Finally the piece of work is ground down until a corresponding ridge is left on the work, preferably at the edge. When this ridge touches the notched part of the wheel, the clearance has been ground on the work.

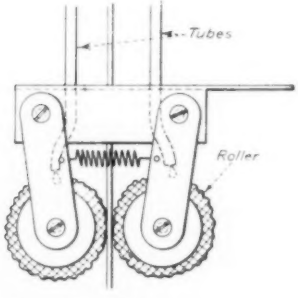
To clean off both work and wheel, the diamond is used to remove wheel stock so the notch disappears, and a final pass is taken over the work to remove the ridge and finish the surface. *Sid Gilbert, Bridgeport, O.*



Formed Drill Bushing Holds Plastic Cup

A SMALL HOLE (0.04 in. dia) had to be drilled in the bottom of a plastic cup-shaped piece we were making. The rounded shape of the work made it a difficult job, and the only way we could solve it was to make a die to hold the work and a drill bushing shaped to fit inside the piece so we could drill from the inside of the part.

This arrangement worked well, providing a finished cup with no chips at the edge of the hole. The bushing and die also prolonged the life of the small drill. *Federico Strasser, Santiago de Chile.*

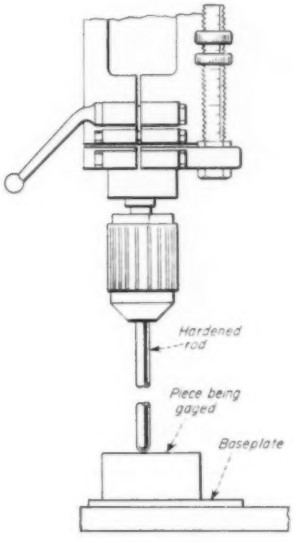


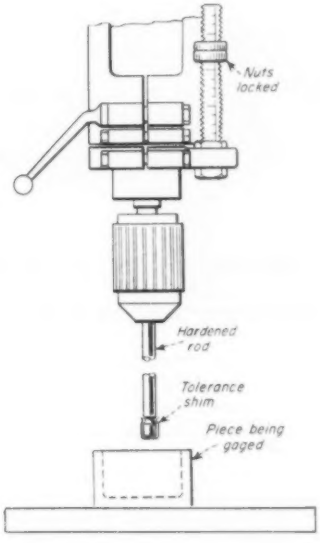
Sheepskin Rollers Oil Press Stock

THIS "PAINT-ROLLER" DEVICE was the only oil feeder that would work economically and conveniently where stock was fed vertically.

Two oil-drip tubes fed oil to the sheepskin-covered wooden rollers. Both rollers were supported on pivots, and were held together against the stock by a coiled spring. This same method could be used for horizontal feed. *Clair W. Mueller, Milwaukee, Wis.*

NON-MARKING CLAMPING SCREWS can be easily made by taking small wingscrews and brazing copper or brass onto the ends. The tips of the threads may have to be checked and reworked to restore the threads, and the brass may have to be cleaned up after the screws have been in use for some time. *Clement F. Brown, Lima, O.*





Drillpress Gage Setups Check Small Parts

INSPECTION of stamped metal parts was made fast and convenient by a simple setup on an unused bench drillpress. The problem was separating two groups of parts that were mixed. One part was 0.010 in. thicker than the other.

The drill table was swiveled to one side to put a solid part of it under the spindle. A case-hardened rod with a rounded end was chucked, and the smaller piece was placed under it. The rod was depressed to touch the part, and the spindle was locked in this position. We had laid a piece of tissue paper on the part, so the rod actually just cleared the part.

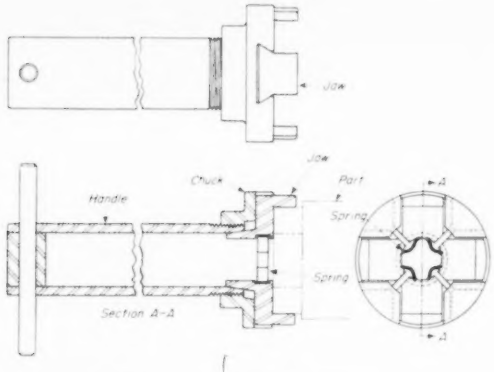
Smaller pieces could be slipped under the rod, but the larger ones would not; providing a simple gage that checked the work rapidly.

A similar setup, without the locked spindle, gaged the bottoms of drawn shells that were to be inspected to make sure the bottoms were not too thick.

A master part with the bottom at the correct thickness was placed on the table, and a hardened gage rod was chucked. This one had a square bottom and was grooved to hold the snap shim, as shown. With the shim on the rod, the spindle was brought down on the master part, and the depth-adjusting nuts were locked.

Finally, the snap shim was removed, and test parts were placed under the spindle. If the rod held the parts down so they could not be moved from side to side under the rod, they were rejected.

Both setups made use of simple inspection principles to gage small workpieces quickly and without the expense of special gages. *Fred Lettino, Astoria, N.Y.*

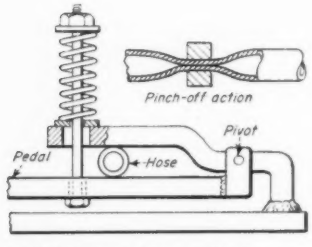


Chucking Wrench Positions Small Part in Tube

ASSEMBLING a threaded member deep inside a long tube turned out to be quite a problem in our shop not long ago. Standard wrenches could not reach down to tighten the member, so we were forced to improvise.

The special wrench consisted of a handle with a threaded end, a chuck that threaded onto the handle, four jaws, and a spring. The part was placed in the chuck jaws first, and the handle was twisted to the right, which closed the jaws. The assembly and part were then inserted in the tube, the part was screwed into place, and the handle was given a quick twist to the left. This released the jaws, which were spread apart by the spring, to clear the part, allowing the assembly to be removed from the tube.

The cross rod in the handle was seated firmly in a bushing to give it a strong support. The lower end of the ID of the handle was tapered to match the taper on the shank sections of the jaws, thus allowing the handle to close up the jaws. A recess bored in the ID of the jaws retained the spring in position, and made the assembly hold together even when a part was not chucked. *Thomas Wilkinson, Arlington, N. J.*



Drill Coolant Controlled By Treadle Valve

SMALL, TRICKY setups on a drill-press where the operator must shift the jig or fixture often, and must load and unload parts quickly, can be speeded with this sort of coolant control. The fluid can be shut off instantly to prevent dribble and splash while the operator makes adjustments.

The valve is a simple floor plate with an overhanging arm that is drilled for a long bolt. A compression spring loads the hinged lower bar to keep the valve normally closed; so the operator must depress the pedal when he starts actual drilling.

Coolant is fed through the rig in a rubber hose, which is pinched off when the pedal is released. *N. Palmer, Sydney, Australia.*

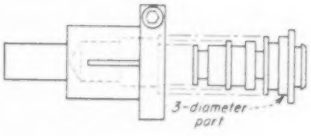
Two Spring Chucks Clamp Odd Lathe Work

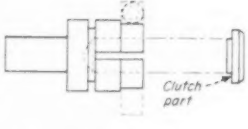
THESE ARE two small spring chucks used for holding parts during a second operation where the regular toolroom collet is not sufficiently accurate.

The first one is for a part with three diameters, all of which must be gripped so the part will be aligned concentrically with the machine spindle. The end must be

faced and turned concentric, with the previously turned diameters. The chuck was made by holding it by its shank and then boring it accurately to fit the part. A split ring with a screw that draws it tight, and four saw cuts through the chuck serve to clamp the part while it is being turned.

The second chuck is for gripping a small clutch part which would be impossible to hold in a stock collet because of the very short length of grippable stock. The chuck was bored accurately to a square shoulder so it would grip the part firmly. Clamping arrangements were the same as on the other chuck. *O. N. Olson, Minneapolis, Minn.*



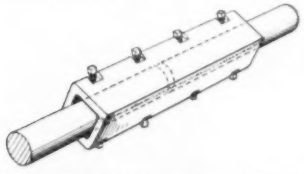


Angle-Iron Box Couples Shaft Sections

EMERGENCY REPAIRS can be made on broken shafts in a small shop, even when regular coulings are not available and cannot be made, by fabricating couplings with ordinary angle iron.

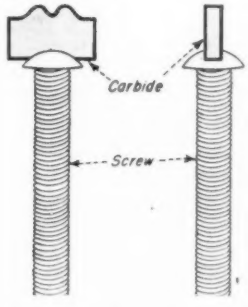
As illustrated, two pieces of iron are welded together to form a box-like affair that will surround both pieces or shafts. Flats are milled across opposite corners of the box, and holes are drilled and tapped into these flats.

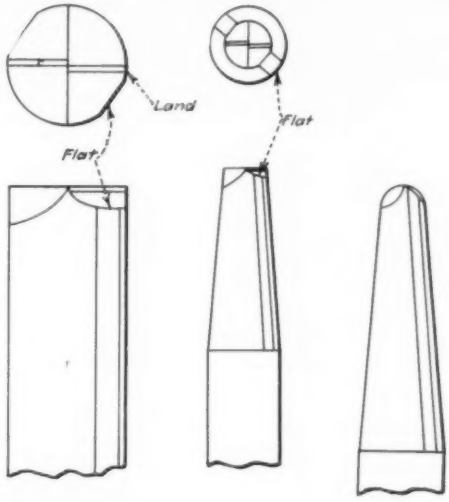
Near-perfect alignment of the two pieces of shaft can be accomplished by running setscrews into the tapped holes. Minor adjustments of the setscrews will align the shaft after a few test revolutions. *Pablo Redl, Buenos Aires, Argentina.*



Screws Plus Carbide Make End Mills

A SIMPLE WAY of producing small end mills has been worked out by the General Electric Co. Standard Carboloy 883 blanks are brazed into the screwdriver slots in the heads of standard round-head screws. The carbide blanks are then ground to the shape desired, and the end mills are ready to use for machining oil grooves in sleeve bearings. *Carboloy Co., Detroit, Mich.*



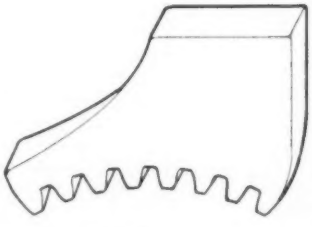


Friction End Mills Cut Smooth Slots and Grooves

THIS ILLUSTATION shows three end mills utilized for cutting small grooves and slots in molding dies. Both operate at a slightly higher speed than conventional finishing cutters. Cut depth is about 0.0015 to 0.003 in.

They are ground from high-speed-steel round stock that is hardened after the OD's and tapers (if any) have been cut. The cutting edge is ground the same as that on a 2-lip end mill. A flat is ground about 1/16 in. behind the land. For a 3/16-in. cutter, this flat would be about 3/64 in. wide.

We notice that this kind of cutter gives a smooth finish and also holds dimensions very well. *Fred H. Lingenfelder, Milwaukee, Wis.*

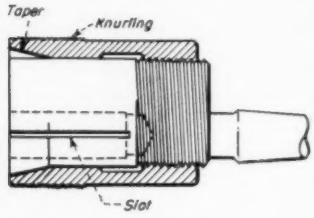


Bull-Gear Gripper Releases Frozen Chuck

I HAVE FOUND a sure and safe way to remove a lathe chuck that is frozen onto the spindle. First, a block of babbit is cast onto a section of the bull gear, forming a number of solid and completely formed teeth. The finished block should look something like the one illustrated at the left.

This block can then be cleaned up and set again on the bull gear. Hitting the block with a hammer will drive the spindle back out of the chuck threads. The idea is to drive the lighter of the two parts which are frozen together. Driving the heavy part off of the lighter part is sure to result in trouble. *Don J. W. Tibbits, Whitefish, Mont.*

BROKEN CENTERDRILLS can be used up to good advantage by installing them in boring bars as toolbits. Grind down the drills, forming the required angles, to fit the bar; or drill out the toolbit hole in the bar to take the round bit. *S. G. Hagen, Richmond, Calif.*



Quick-Acting Holder Grips Tap

TAPHOLDERS for ring jobs where the parts are stacked on the tap shank successively until a number are completed have been discussed before in Practical Ideas. This one is the result of a bull session in the engineering office where we decided to make one that could be rapidly taken down to drop off tapped parts. The holder rechucks the tap quickly and on center.

A main holder body was made with a Morse taper for the tailstock, an on-center tapered bore for the tap, and an off-center OD that was threaded to take a closing collar. The body was split down the center of the tapholding bore, which was much off center and made the closing action of the holder dependent only on the smaller jaw. This improved alignment and made accuracy good.

The outer (left) end of the body was tapered out, but the tapered section on the larger jaw was ground off so only the smaller jaw would be compressed by the collar. The collar was threaded to fit the body, and was tapered at the left end to match the body taper.

Because of the eccentric weight, this holder can only be installed on a machine in good condition with fairly tight bearings. However, results are of good quality and production was almost doubled with the holder. *Frank M. Butrick, Jr., Alma, Mich.*

Adjustable Headstock Center Shifts for Threading Work

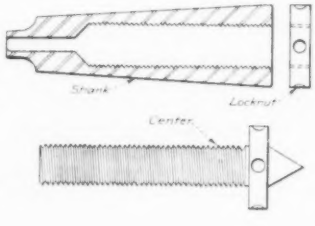
A BIG JOB, located on the carriage of a lathe, had to be threaded internally with a tool in a boring bar mounted between headstock and tailstock centers. As the tool could not complete the thread in one pass, we had to shift it to first do the forward edge of the thread, then the back edge.

This shifting could have been done by disengaging the headstock gears, moving the driving gear one tooth forward, and engaging them again; but this method was not accurate. Instead, we made this adjustable center, with which we could move the boring bar and tool back any amount desired.

A tapered shank to fit the spindle nose of the lathe was drilled out and threaded for the center. The position of the center was fixed and held tight by a locknut on the center. This nut was jammed against the shoulder of the shank.

Shifting the boring bar was simple with this arrangement. First, the tailstock was loosened on the ways of the machine. Then the locknut on the center was loosened, and the center was threaded in or out, as desired. Finally the tailstock was closed up and tightened, and the locknut on the center was tightened.

For accuracy, the threads on the center and in the shank were a close fit. To avoid an air pocket, a hole was drilled through the shank. Some $\frac{3}{8}$-in. holes were drilled axially in the locknut and center head so drill rods could be inserted to adjust them. *Michael Poprick, Chicago, Ill.*



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115th Winner:

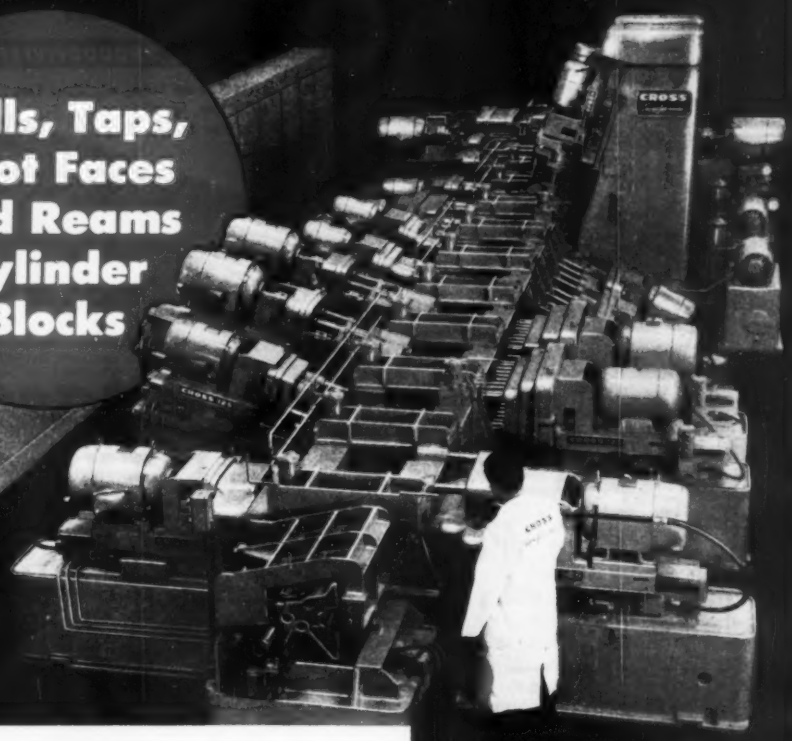
(For October 16 issue)

Gerhard Wenke

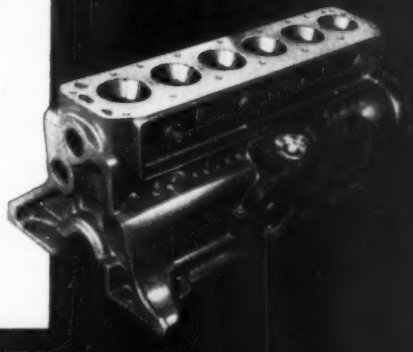
Radius-turning Tool

Another Transfer-matic by Cross

Drills, Taps, Spot Faces and Reams Cylinder Blocks



- ★ 100 cylinder blocks per hour at 100% efficiency.
- ★ 13 stations with automatic transferring.
- ★ Chamfers cylinder bores top and bottom; drills and reams distributor hole and dipstick hole; drills oil holes from main bearings to oil gallery; drills, chamfers and taps head stud holes and pan rail holes.
- ★ Cleaning unit at Station 11 vibrates and rotates part 360° to remove all chips prior to tapping.
- ★ Inspection unit at Station 12 stops machine if holes are not to proper depth.



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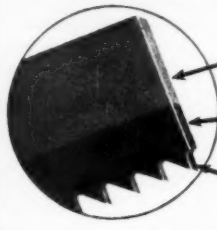
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JIC Pneumatic Standards...IV

(Continued from the Dec. 25, 1950, number)

A-4—PIPING, FITTINGS AND PASSAGES

(Piping includes all pipe, tubing, hose, and fittings. Passages include all air conductors other than piping.)

A4.1.1. When requested on purchase order, a piping layout or photograph shall be furnished.

A4.1.3. Piping shall have adequate strength to withstand additional pressure, including surge pressure, within the safety limits of the entire circuit. A factor of safety of at least eight (8) over normal working pressure is recommended except for flexible hose. (See Paragraph A4.2.4.)

A4.1.5. Piping leads in working circuits between actuating devices and feed control devices shall be constructed as to confine a minimum volume of air, the purpose being to maintain constant, controlled motion and minimize the effect of varying forces.

A4.1.6. (*A*) Solderless pipe connections shall be used: flared, flareless, self-flaring, flanged, or equivalent.

(*B*) When flared-type fittings are used (which require a flaring tool), the angle of flare of tubing shall be 37° from the centerline, 74° included angle, and flare dimensions shall be in accord with Army-Navy design 10061.

(*C*) All pipe threads shall be Dryseal American (National standard taper pipe threads (N.P.T.F.).

(*D*) Fittings with straight threads and which incorporate seals that seal with pressure may be used in place of pipe-thread fittings.

(*E*) All piping connections shall be designed and installed to permit quick removal and re-assembly by means of hand tools.

(*F*) Tubing OD sizes shall increase in 1/16-in. increments from 1/8 in. to and including 3/8 in. and in increments of 1/8 in. above 3/8 in. up to and including 1-in. dia and in 1/4-in. increments above 1-in. dia.

(*G*) Fittings with restricted or stepped-up passages are not recommended.

A4.1.7. All piping, piping fittings, passages, storage or surge tanks, cored holes, or drilled holes must be free of burrs or foreign matter which might cause damage to any pneumatic unit. Sharp edges shall be removed whenever they adversely affect the flow of air.

A4.1.8. Whenever practicable, each piping run must be integral and continuous from one piece of apparatus to another. Piping runs must be removable without dismantling equipment components and without bending tubing or springing it in a manner to damage it. All rigid piping must be securely supported at frequent intervals to avoid vibration or movement. Points of contact or support on the outside of the piping shall be designed so they will not result in damage to the piping. Piping shall not be welded to supports.

A4.1.9. When high- or extra-high-pressure piping is used, all connections shall be welded to steel flanges; or connections may be used which are equal in performance and ease of assembly. Flanged connections shall use sealing devices that seal with pressure (all welded joints shall be stress relieved).

A4.2.4. All portions of piping circuits subject to movements in which flexible hose is required, oil-resistant hose shall be used and shall be fabricated to a pressure safety factor of at least five (5) with respect to the circuit in which it is used. Flexible hose shall have vertical connections and shall have sufficient slack to avoid sharp flexing and straining. Horizontal connections are acceptable only if hose is adequately supported.

A4.2.6. Piping shall not be placed where it will interfere with the adjustment, repair or replacement of control units, and piping connections shall be readily accessible for maintenance.

A4.2.7. When construction of equipment necessitates shipment or moving in sections, thorough precautions shall be taken to protect piping runs, whether they be left in place on one of the equipment sections, or whether they are removed and separately boxed for shipment. All male threads shall be sleeved, and all piping openings or female threads equipped with suitable closures.

A4.2.8. Piping shall be so arranged that pressures may be tested at accessible locations, preferably at built-in checking stations which shall be indicated on diagrams.

A4.4—**Identification of Piping and Checking Stations:**

A4.4.1. Piping runs and checking stations shall be permanently identified to correspond with diagram markings.

A6—VALVES, ACCESSORIES AND DEVICES

A6.1—**Filters and Lubricators:**

A6.1.1. Means shall be provided for the removal of deleterious materials from the pneumatic system.

A6.1.2. Suitable means of air-line lubrication shall be provided when practicable.

A6.1.4. Filters shall be of such construction that the filter medium can be removed for cleaning or replacement without disturbing the piping. When practicable, suitable means shall be provided to indicate when filter should be cleaned.

A6.1.5. Intake cleaners shall be provided and shall be of ample size to clean more than double the capacity. Suitable means shall be provided to remove cleaners.

A6.2—**Sealing Devices:**

A6.2.1. All sealing devices must be of such materials that they will not be adversely affected by air or lubricants.

A6.2.3. Sealing devices on reciprocating or rotating shafts shall prevent leakage, except that required for lubrication of such devices under working conditions without damaging shafts.

A6.2.4. Clearances in sealing glands shall be such as to prevent undue extrusion of the sealing material.

A6.2.5. Stuffing boxes for automatic packing shall be so designed as to prevent adjustment beyond the functional limits of the packing.

A6.2.6. Industrial equipment shall be so designed as to facilitate easy replacement of packings.

A6.2.7. J.I.C. Standard part numbers shall be provided for all packings. If none is available, principal dimensions such as inside diameter, outside diameter, stack height and material shall be provided.

A6.3—**Cylinders and Pistons:**

A6.3.1. Cylinder bores having fitted pistons shall be finished in a manner consistent with the type of service intended and shall be free of porosity or other defects.

A6.3.2. Cylinders shall be located in alignment with work slides, and shall be such that no slide or radial load shall occur on piston rod or ram, unless other suitable provisions are made to take such loads.

A6.3.3. Ends of cylinders shall utilize sealing devices that do not leak under manufacturers' intended operating conditions. Cylinder external sealing devices shall be readily accessible for servicing.

A6.3.4. (*A*) Cylinders shall be accessible for servicing. (*B*) Cylinders shall be separate, not cast integral with equipment.

A6.3.6. Piston rods shall be adequately protected by installation of cleaning and sealing devices. Material and hardness of piston rod shall be such as to prevent scoring.

A.3.7. When pistons are assembled to rod they shall be positively locked.

A6.3.8. When necessary, cushions shall be provided on cylinder ends.

A6.4—**Valves:**

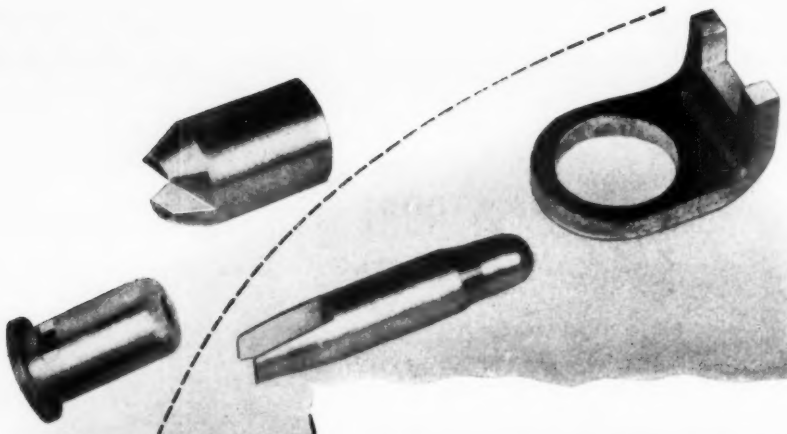
A6.4.1. Adjustable valves shall be arranged so that wires and seals can be used after final adjustments and locking.

A6.4.3. When practicable, subplate-mounted valves (or equivalent) shall be used so that their repair or replacement can be made without disconnecting individual air lines. Seals of the pressure-sealing type or seals of a type that will provide the equivalent of pressure-medium-sealing type are recommended. Means shall be provided so that subplate-mounted valves cannot be improperly assembled to the subplate.

A6.4.5. The operation of a valve shall not contribute to detrimental surges in the pneumatic system.

A6.4.6. On vertical or inclined slides or rams, means shall be provided to prevent rapid drop when air power is shut off.

A6.4.7. Solenoid-operated valves shall be so designed, constructed and installed as to eliminate destructive hammering.



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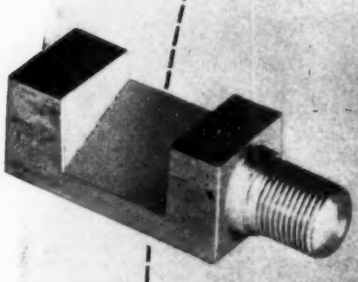

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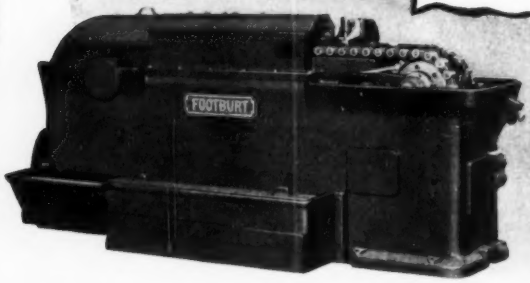

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JIC Pneumatic Standards...V

A6.5—Storage or Surge Tanks:

A6.5.1. Tanks shall be so constructed as to conform to state regulations. Where no regulations are in effect, they shall be constructed to withstand at least five (5) times the operating pressure of the pneumatic system they serve.

A6.5.2. Tanks shall be designed and constructed so that they cannot be disassembled while containing an unsafe charge. Means shall be provided for safely relieving air pressure.

A6.5.3. Pneumatic circuits incorporating tanks shall be so arranged that the system can be bled at the low point of the circuit.

A6.5.4. See paragraph A7.1.3 of the "Safety" section.

A6.5.5. Where applicable, all tanks shall incorporate suitable automatic condensate dump valves and suitably protected water indicators.

A6.6—Storage or Surge-Tank Nameplate:

A6.6.1. The following information shall be permanently indicated on each tank:

(*A*) National Board serial number.
(*B*) Name of manufacturer.
(*C*) Maximum allowable working pressure.
(*D*) Manufacturer's serial number.
(*E*) Year built.

A7—SAFETY

A7.1.1 Flexible lines shall be restrained or confined, if their failure might constitute a hazard.

A7.1.2. Operator shall not be required to reach past revolving spindles, moving tools, or moving machine elements to reach controls.

A7.1.3. Pneumatic circuits incorporating storage or surge tanks shall be so interlocked as to vent or isolate pressure when power is shut off. On circuit applications where tank pressure is isolated, full information shall be given on or near tank for proper servicing without injury to personnel.

Glossary of Terms Used in These Pneumatic Specifications

ACTUATOR: A device to convert fluid energy into mechanical motion.

AUTOMATIC CONTROLS: Those actuated in response to the cycle of the equipment.

BACK CONNECTED: Where piping connections are on normally unexposed surfaces of pneumatic components.

CHANNEL: An air passage the length of which is large with respect to its cross-section dimension.

CIRCUIT: An arrangement of component parts or pneumatic equipment interconnected to a specific appliance or appliances.

CLEANER: A device for the removal of solids from a fluid wherein the resistance to motion of such solids is in a straight line.

COMPARTMENT: A space within the base, frame, or column of the equipment.

COMPRESSORS:

Fixed Displacement: A compressor which delivers a relatively constant volume of air per cycle.

Variable Displacement: A compressor in which the volume per cycle can be varied.

CYLINDER: A linear-motion device in which the thrust or force is proportional to the effective cross-sectional area and to the pressure differential.

CYLINDER, SINGLE ACTING: A cylinder in which the air pressure can be applied in only one direction—

Plunger Type: A cylinder in which the internal element is of a single diameter, and upon which the seal applied is of the contracting type.

Piston Type: A cylinder in which the internal element is of a single diameter, and and the seal is of the expanding type.

CYLINDER, DOUBLE-ACTING: A cylinder in which air pressure can be applied in either direction—

Single-End Rod: A cylinder with a rod extending from one end.

Double-End Rod: A cylinder with two rods, one extending from each end.

INCLOSURE: A housing for pneumatic apparatus.

FILTER: A device for the removal of solids from a pneumatic system wherein the resistance to motion of such solids is in a tortuous path.

FLUID: Any material that will take the shape of the container in which it is placed.

FRONT CONNECTED: Where piping connections are normally on exposed surfaces of pneumatic components.

PNEUMATIC PANEL:

1. Pneumatic Mounting Panel—A plate on which may be mounted a number of pneumatic actuating components.

2. Pneumatic Control Panel—grouping of pneumatic control units mounted to form one assembly on a plate, or in a casting, and having a single mounting surface.

LINE: A tube, pipe, or hose which acts as a conductor of air.

LINE, EXHAUST: A return line which carries power or control actuating air back to the atmosphere.

LINE, JOINING: A line which crosses or connects with another line on a diagram and which also connects in construction. The junction of the lines shall be indicated by a dot which must be at least three times the width of the line.

LINE, PASSING: A line which crosses another line on a diagram, but which does not connect in construction. Line on a diagram to have no swell at crossing.

LINE, PILOT: A line which acts as a conductor of power actuating air.

LUBRICATOR: A device for adding lubricant to the actuating medium.

MANUAL CONTROLS: Those actuated by the operator, regardless of means.

MOTOR, OSCILLATING: A motor producing a maximum angular rotative movement of less than 360° in either direction.

MOTOR, ROTARY: A motor producing rotary motion having torque output proportional to the displacement per revolution and to the pressure drop between intake and exhaust ports.

MOTOR, ROTARY, FIXED-DISPLACEMENT: A rotary motor in which the displacement per revolution is not adjustable.

MOTOR, ROTARY, VARIABLE-DISPLACEMENT: A rotary motor in which the displacement per revolution is adjustable.

PASSAGE: A machined or cored connection which lies within or passes through a pneumatic component, and which acts as a conductor of air.

PHASE OF CYCLE:

0. Neutral
1. Rapid Advance
2. Feed or Pressure Stroke (Forward and Return)
3. Dwell
4. Rapid Return

RAPID ADVANCE: The approach of the tools or workpiece to the feed position.

FEED: The portion of the cycle where work is performed on the workpiece.

DWELL: The portion of the cycle where the feed rates or pressure stroke is stopped.

RAPID RETURN: The return of the tools or workpiece to the cycle starting position.

PORT: An opening at a surface of component; e.g., terminus of a passage. May be internal or external.

PORT, VALVE: A controllable opening between pasages; e.g., one which can be closed, opened, or modulated.

POSITIVE-POSITION STOP: A structural member which definitely limits the working motion at a desired position.

POSITIVE SAFETY STOP: A fixed structural member which confines maximum travel within the design limits of the machine or equipment.

PRESSURE-TIME DIAGRAM: A graphical presentation of pressure in psi plotted against time for a complete cycle of the equipment.

RESTRICTION: A device which produces a deliberate pressure drop or resistance in a line or passage by means of a reduced cross-sectional area.

CHOKE: A restriction, the length of which is relatively large with respect to its cross-section dimensions.

ORIFICE: A restriction, the length of which is relatively small with respect to its cross-section dimensions.

SCHEMATIC DIAGRAM: A drawing or drawings showing the functional construction of all valves, controls and actuating mechanisms.

SEALING DEVICE: A part or assembly of parts used to prevent leakage between two or more other parts.

SEPARATOR: A device to separate water or other materials of different specific gravities from the actuating medium.

SUB-PLATE (Back Plate): An auxiliary mounting for a pneumatic actuating component to which piping connections are mounted.

SURGE: A transient rise of air pressure in the circuit.

SYMBOLIC DIAGRAM: A drawing or drawings showing by means of approved standard symbols each and every piece of pneumatic apparatus including all inter-connecting lines.

TRIP DEVICE: A mechanical element for the actuation of a position control.

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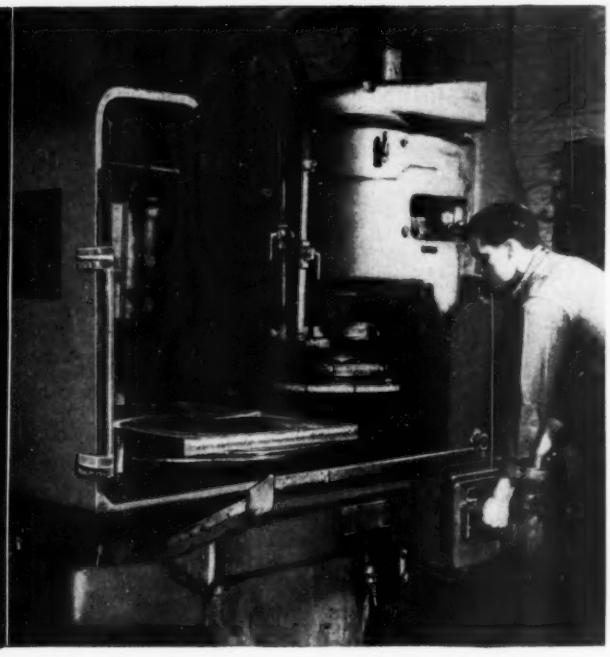

Many manufacturers learn about the superior qualities of Robertson Segments for the first time when they try them out on difficult surface-grinding operations. Whether they are working on tiny thread chasers, or 30″ x 30″ boiler plate, they soon find they can count on Robertson to increase production substantially and make a corresponding decrease in power and wheel costs.

One large company, for instance, was grinding forged steel discs 11½″ in diameter and .700″ thick. To reduce thickness to .438″, .262″ stock had to be removed. With a conventional wheel, the plant averaged six pieces every five hours—the equivalent of 24 pieces per set of segments. When a Robertson Segmental Wheel WA-243-I-2V was substituted on this job, down-feed was increased to .012″ per minute and six pieces were finished-ground every two hours. Fifty-four discs were ground with each set of Robertson Segments. Ampere reading never went above 65-70. More than twice as much wheel life . . . plus the ability to greatly increase production.

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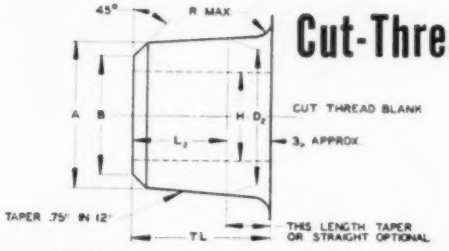
Cut-Thread Blanks for Dryseal Parts



Thread blank (cut threads) for Dryseal standard external taper pipe thread

Standard pipe-thread taps and chasers are unsuitable for cutting Dryseal threads, with these exceptions:

Crest of teeth on standard taper taps, dies, or chasers NPT may be ground down to conform with width of flats specified for Dryseal standard-taper pipe threads NPTF.

Standard coupling straight pipe taps NPSC, except the 1/4-18 size, can likewise be modified for tapping Dryseal intermediate straight pipe threads.

Standard grease-fitting tap NPSG 1/8-27 is suitable without modification for tapping Dryseal fuel straight pipe threads NPSF.

Dimensions of Cut-Thread Blanks for Dryseal External Taper Threads

Size	Outside Diameter at L_2 Length from Small End (Basic Thread Plus One Turn Large with Maximum Truncation)	Outside Diameter at Small End (Basic Thread Plus Two Turns Large with Maximum Truncation)	Chamfer Diameter (Minor Diameter at Small End)	Minimum Length from Small End to Shoulder L_2 + (3p approx.)	Corner Radius	Recommended Hole Size (Note 1)
	D_2 +.003 -.000	A +.003 -.000	B +.000 -1/64	TL	R Max.	H
1/16-27	0.315	0.301	15/64	3/8	1/32	1/8
1/8-27	0.407	0.393	21/64	3/8	1/32	3/16
1/4-18	0.546	0.523	27/64	9/16	1/16	9/32
3/8-18	0.681	0.658	9/16	9/16	1/16	13/32
1/2-14	0.850	0.820		3/4	5/64	9/16
3/4-14	1.060	1.029	29/32	3/4	5/64	23/32
1-11-1/2	1.327	1.289	1-1/8	15/16	3/32	15/16
1-1/4-11-1/2	1.672	1.633	1-15/32	31/32	3/32	1-1/4
1-1/2-11-1/2	1.912	1.872	1-11/16	1	3/32	1-15/32
2-11-1/2	2.387	2.345	2-5/32	1-1/32	3/32	1-15/32
2-1/2-8	2.893	2.825	2-19/32	1-33/64	1/8	2-5/16
3-8	3.518	3.450	3-7/32	1-37/64	1/8	2-29/32

[1] The hole sizes recommended represent a desirable maximum, strength of wall being considered. However, as considerations other than wall strength frequently control the hole size in specific applications, the recommendations should not be construed as a requirement of this standard.

Drilled-Hole Sizes for Dryseal Internal Pipe Threads

Size	Straight Pipe Thread						Taper Pipe Thread						Countersink
	Fuel (NPSF)		Intermediate (NPSI)		Min. Desired Length of Full Thread	Hole Depth for Plug End Tap,	NPTF Commercial (Not Reamed)		NPTF (Reamed)		Min. Desired Length of Full Thread	Hole Depth for Standard Tap	90° x Diam. +1/64 -.000
	Min.[1] Minor Diam.	Drilled Hole Size +.003, -.001	Min.[1] Minor Diam.	Drilled Hole Size +.003, -.001			Min. Minor Diam. 2 Threads Small from Large End	Drilled Hole Size +.003, -.001	Min. Desired Minor Diam. at Small End	Drilled Hole Size +.003, -.001			
1/16-27	0.2482	0.2500	0.2505	0.2500	5/16	15/32	0.2480	0.2460	0.2356	0.2344	5/16	9/16	5/16
1/8-27	0.3406	0.3437	0.3429	0.3437	5/16	15/32	0.3403	0.3390	0.3279	0.3281	5/16	9/16	13/32
1/4-18	0.4422	0.4440	0.4457	0.4440	15/32	23/32	0.4417	0.4375	0.4241	0.4219	15/32	13/16	35/64
3/8-18	0.5776	0.5781	0.5811	0.5781	1/2	23/32	0.5771	0.5781	0.5587	0.5625	1/2	13/16	43/64
1/2-14	0.7133	0.7187	0.7180	0.7187	21/32	15/16	0.7127	0.7031	0.6883	0.6875	21/32	1-1/16	27/32
3/4-14	0.9238	———	0.9231	———	21/32	15/16	0.9232	0.9219	0.8976	0.8906	21/32	1-1/16	1-3/64
1-11-1/2	1.1600	———	1.1655	———	25/32	1-5/32	1.1593	1.1562	1.1290	1.1250	25/32	1-1/4	1-5/16
1-1/4-11-1/2	———	———	———	———	———	———	1.5041	1.5000	1.4725	1.4687	13/16	1-5/16	1-21/32
1-1/2-11-1/2	———	———	———	———	———	———	1.7430	1.7344	1.7115	1.7031	13/16	1-5/16	1-29/32
2-11-1/2	———	———	———	———	———	———	2.2170	2.2187	2.1844	2.1875	13/16	1-5/16	2-3/8
2-1/2-8	———	———	———	———	———	———	2.6488	2.6406	2.5983	2.5937	1-1/4	1-27/32	2-29/32
3-8	———	———	———	———	———	———	3.2751	3.2656	3.2194	3.2187	1-11/32	1-29/32	3-17/32

[1] Minimum minor diameter for internal straight pipe threads is based upon minimum pitch diameter and minimum truncation and will vary with the pitch diameter.

"Mopping up"

a production problem with CLEARING presses

O-Cedar Corp'n, Chicago, recently introduced a new type of floor mop which has made a big hit with American housewives. A quartet of Clearing presses is turning out the several stamped parts required in an uninterrupted production stream. Two of the presses are fed automatically from coiled strip stock and progressive dies result in a finished stamping at every stroke.

To produce their modern mops, O-Cedar chose modern Clearing presses for their precision and dependability. If you have, or are expecting, a mass production requirement of large or small parts, it will pay you to consult Clearing.

CLEARING MACHINE CORPORATION

6499 WEST 65TH STREET ★ CHICAGO 38, ILLINOIS

CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

TALKING SHOP

Trouble Shooting

MOST EDITORS, sooner or later, compress their thoughts between hard covers and emerge as book authors. It's the expected thing. Thus at least five editors of *AM* have authored books. But not all have been the expected weighty tomes. Executive Editor Tangerman, a dozen years ago, wrote two books on whittling and woodcarving, which are still leading books in their field. Now Associate Editor Andy Ashburn has come forth with "Automotive Trouble Shooting and Maintenance." A 305-page volume jampacked with sketches, it sells for $4.50 through McGraw-Hill Book Co., New York, N. Y. Outgrowth of some textbook work Captain Ashburn did at the Ordnance School during World War II, the book provides play-by-play diagnosis and repair data.

Hot Hardness

TO TEST HARDNESS of alloys at 1350 F in a Brinell tester, one Penna. steel company uses Kentanium balls as indentors, seated against a Stellite insert in the ram. Steel and carbide balls were found subject to excessive oxidation at these temperatures. A 10-mm Kentanium ball tested more than 100 specimens, showing hot hardness of 130 to 160 Brinell in the alloy.

Student Production

HOW CAN production units in college shops be demonstrated to, or operated by, students without excessive costs for wasted materials? A modern high-production machine tool chews up an appreciable amount of material, even in a demonstration run, and stock is hard to get. Further, the cost of tooling such a machine is appreciable. What to do?

Cornell has tooled a big turret lathe and several other units in cooperation with a nearby manufacturer, who provides a supply of castings for periodic long production demonstrations. Purdue has tooled a turret lathe, a screw machine, a hand miller, a horizontal miller, and several drills to produce, from World War II surplus stock, several little gadgets that the university can hand out to visitors and alumni. Included is a small "Old Oaken Bucket" in which the effect of vertical staves is obtained by setting a form tool so it chatters under control. The Purdue machine shop will shortly be joined by a completely new foundry, and a modernized heat-treat and welding setup.

Here is a continuing problem on which Metalworking can be of real help—assisting engineering colleges to teach modern production methods.

72-ft Boring Mill

RECENT REPORTS from a European machine-tool builder are that a 72-ft boring mill actually was built and operated in Germany during World War II. Where it is now, no one seems to know. It was not a small machine with columns that could be moved back, but a real 72-ft. machine —about twice the size of our largest. There were also on the boards in Germany before the war designs for several 32-ft vertical boring mills capable of speeds up to 36 fpm at the table periphery. Again information on whether the machines were ever built is lacking.

Who's Asleep?

"AN EMPLOYEE who falls asleep on his job shall be subject to discharge," reads a clause in a recent mid-western union contract. It goes on to define sleep as: "If a foreman finds him lying down on duty or if a foreman finds him with his eyes closed, and he fails to awaken when the foreman turns a flashlight into his eyes at a distance not greater than 15 ft." We'll accept everything except the lying down — the best sleeping we've seen done is on a stool or standing up; we even perfected the technique in our apprentice days of sleeping without leaning on anything. But a flashlight would have caused a start—that or a rifle shot or a squeak at the dead center.

Flash Check

ROSS GEAR & TOOL CO., Lafayette, Ind., makes a critical flash weld between worm and hollow drive shaft on its automotive steering gears. In addition to visual and magnetic non-destructive tests, pieces are frequently bent and twisted to destruction, to check constantly on dependability of the critical element in the assembly.

T Seal

TO CUT FRICTION almost to zero on a hydraulic-piston seal, the usual O ring is replaced by a synthetic-rubber T ring recessed head down into the piston. The vertical element of the T is supported on each side by rings of laminated phenolic material. Pressure compresses the rear laminated ring, crowding it against the T head and displacing enough rubber to crowd the other phenolic ring and the T foot against the cylinder wall. Such seals have been used at intermittent pressures to 1000 psi, with about 0.010 to 0.015-in. piston clearance on a side.

Contour Shaving

TWO SPUR GEARS must mate without backlash to handle the control mechanism of the new Gemmer "Hydraglide" power steering gear for automobiles. The problem was to maintain necessary tightness, yet allow for slight (less than 2°) misalignment of one gear shaft in a plane parallel to the shaft axes but at 90° from the centerline between them. Contour shaving of the teeth of the possibly misaligned gear solved the problem.

News of Metalworking

McGraw-Hill

WORLD NEWS

TRAINS FOR INDONESIA—Indonesian State Railways, desperately short of locomotives and coaches, has earmarked 150-million rupiahs (nearly $14 million) for purchase of 100 locomotives from German-Krupp factories, 100 daycoaches from Beynes Construction Co., Netherlands, and 1000 freight cars from Werkspoor, also Netherlands.

JAPAN EXPORTS MACHINERY—Contracts for Japanese machinery concluded in October amounted to approximately $10.2 million, an increase of $1.9 million over August.

TURKEY BUYS TRACTORS—A British firm, Fordson Tractors, has secured a Turkish order worth £620,000. Fordson will deliver 1150 tractors—mostly diesel engine—in first three months of 1951.

STEEL FOR COLOMBIA—Salem Engineering Co., Ohio, has submitted to the Colombian government a proposal to build steel mills at Paz del Rio to cost $20 million.

Tougher Contract Renegotiation Law Expected from 82nd Congress

WASHINGTON — Tighter restrictions on profits from defense business is one thing you can count on early in the new year. Defense Secretary Marshall will soon ask the new 82nd Congress for a much tougher contract renegotiation law. There's little doubt but that the general will get substantially what he asks for.

Many businessmen will argue that the military's current methods for holding their profits down to a "reasonable level" are tough enough now.

But the point is: A great number of contracts are stll being let by the military that are, under the 1948 law, not subject to renegotiation. For instance, Army, Navy, and Air Force can't take a second look at profits from "advertised bid" contracts, contracts for raw materials (wasting assets), construction, and agricultural commodities.

Under the renegotiation law the military is asking for, only unprocessed agricultural commodities would continue to be exempt.

• **The new bill** will follow closely the language of Rep. Vinson's H.R. 9584 introduced last August. It would apply to all contracts now in force, regardless of what the law was when the original contract was signed, provided deliveries are made after the bill becomes law.

Any company which has receipts and accruals from defense contracts in excess of $100,000 during the company's fiscal year (as determined for tax purposes), would be subject to renegotiation of the defense contracts.

• **All contracts** (except agricultural)—Prime and sub alike—would be subject to renegotiation. The present $1000-and-under exemption is described as an administrative monstrosity. It won't be asked for again. It's much simpler for a large company to renegotiate profits of all its defense business rather than trying to cull out those due to $1000 jobs.

There is one group of contracts where $25,000 (rather than $100,000) is the "accruals and receipts" figure that determines whether or not the company is subject to renegotiation. These are subcontracts where the amount payable "is contingent upon the procurement of a contract or contracts. . . .", or where the fee to be paid is for patent royalties or formula use.

U.S. Steel Will Erect New Mill Near Trenton To Supply Middle Atlantic, New England Areas

NEW YORK — United States Steel Corp. has announced details of a new, wholly-integrated steel plant near Morrisville, Pa., which will have the capacity to produce 1,800,000 ingot tons of steel a year.

To be named the Fairless Works, the new mill will start rising on the banks of the Delaware River, opposite Trenton, N. J., early next spring and is scheduled for completion by the end of 1952. Within six to twelve months after construction begins the first finished steel products are expected to start rolling out of the plant. A wide range of products will be produced, including bars, standard steel pipe, wire rods, hot and cold rolled sheets and strip, and tin plate.

The plant will add more than 4-million tons to the annual steel capacity of U.S. Steel's various facilities. The natural area for distribution of the products of the Fairless Works is the Middle Atlantic and New England markets, the corporation indicated. Being located on Tidewater, the new mill can also be used for export shipments.

Orders for important items of equipment and machinery for the new mill are being placed. Actual construction of the plant itself will begin as soon as possession of the complete plant site is obtained in about two months. About 4400 production workers, exclusive of the clerical and management staff, will be employed.

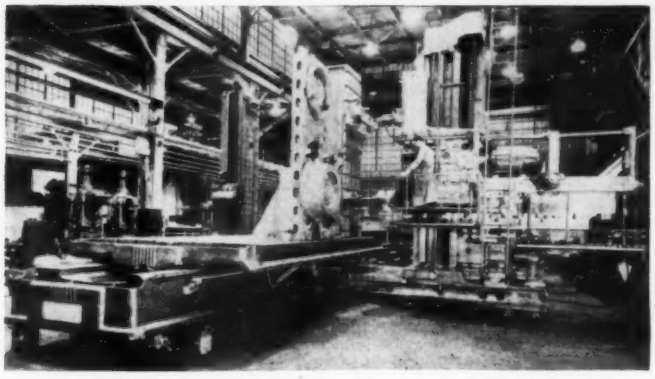
It is expected that the new plant eventually will utilize a part of the high grade iron ore which another U.S. Steel subsidiary, Orinoco Mining Co., plans to mine from its iron ore properties in eastern Venezuela. Pending availability of Venezuelan ore, the Fairless Works will utilize other foreign ores as well as domestic iron ore.

$78 Million in Defense Contracts For Ohio Firms

CLEVELAND — About $78 million worth of defense contracts have been awarded to Ohio manufacturers within the last three weeks, Cleveland Ordnance District has announced. Biggest order was for $63 million worth of jeeps from Willys-Overland Motors, Toledo. Other orders announced:

Ohio Steel Foundry Co., Lima, $1,000,000, development of facilities for production of breech rings for guns; Yoder Co., Cleveland, $4,800,000, artillery shells; Geometric Stamping Co., Cleveland, $800,000, mine fuses; Mullins Mfg. Co., Salem, $4,100,000, mortar shells; Defiance Automatic Screw Co., $540,000, artillery fuses; Ekco Products, Massillon, $2,800,000, cartridge cases; Hoover Co., Canton, $870,000 rocket fuses.

(See pages 133, 134 for other contract awards.)



RENAULT MOTORS, near Paris, will get this large horizontal boring, drilling and milling machine built by Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., purchased through the Marshall Plan. Various motions of the machine are controlled by a General Electric three-dimension electronic tracer-control system which automatically machines steel dies to exact shape of wooden models. Tracing head mounted directly above milling spindle is shown following surface of wooden pattern while milling cutter reproduces same form in die steel

Big Orders for Machine Tools Begin To Show Up in Defense Contracts

ARMY

Monarch Machine Tool Co., Detroit, lathes, engine, motor, $199,400.

Cincinnati Lathe & Tool Co., Oakley, Cincinnati, Ohio, lathes, engine, motor, $176,798.

Chicago Pneumatic Tool Co., Detroit, runner wrench, $121,240.

Chrysler Corp., Detroit, engines, complete, $3,772,856.

Zenith Carburetor Co., Detroit, carburetors, $240,619.

Active Gear Co., Chicago, gears, $150,623.

Federal Motor Truck Corp., Detroit, rods, spacer, $73,403; bushings, clamps, $27,118; line, support, kit, $25,483.

International Harvester, Detroit, sleeves, engine, cylinder, $73,800; covers, $38,400.

Wagner Electric Corp., St. Louis, Mo., heads, lines, hose, $86,523; union, rear axle washer, $57,699; misc. cups, cylinders, $33,599; cups, hydraulic brake, $44,880.

Wilcox & Gibbs Sewing Machine Co., New York, gun parts, $526,990.

Pullman-Standard Car Mfg. Co., Chicago, machining & assembly of muzzle brakes for 76mm guns, 90mm guns, and 120mm guns, $97,747.

Firestone Tire & Rubber Co., Akron, Ohio, spare parts for 75mm rifle, $179,986.

Bethlehem Steel Co., Bethlehem, Pa., steel, alloy, bars, for breech blocks in various sizes, $348,230; forgings, tube, alloy steel, for 90mm gun, $1,087,500.

Western Electric Co., New York, telephone equipment, $287,652.

Lionel Corp., New York, headsets, $879,750.

United States Electric Mfg. Corp., New York, flashlights, $383,500.

Kellogg Switchboard & Supply Corp., Chicago, relay racks, $924,685; switchboard equipment, $106,567.

General Motors Corp., Detroit, range finders, $8,000,000.

Remington Arms Co., Inc., Bridgeport, Conn., primers, electric, $602,854.

Timken Bearing Co., Canton, Ohio, spare parts, $157,915.

Bowers Battery & Spark Plug Co., Reading, Pa., batteries, $166,121.

Electric Auto Lite Co., Detroit, pins, drive assembly generators, cups, etc., $474,530; armatures, supports, cables, $59,698; sealed lamp units, $149,157; starter assembly, ring, $164,496; lead, insulator, $95,428.

Gabriel Co., Cleveland, shock absorbers, $141,756.

Willys Overland Motors Corp., Toledo, levers, bearing, cups, $1,041,217.

International Spare Parts Corp., Long Island City, N. Y., adapter, arms, bolts, caps and clips, $430,882; sleeve, shaft assembly spindle, $28,720.

American Bosch Corp., Springfield, Mass., wiper, windshield assembly, $142,290.

Continental Motors Corp., Muskegon, Mich., kit, gasket set, bearing, $109,475; head cylinder, engines with assembly, $4,553,555.

Burgess Norton Mfg., Geneva, Ill., tank track parts, $3,793,619.

General Electric Co., Detroit, misc. lamp parts, $592,667.

Westinghouse Electric Co., Detroit, misc. lamps, $306,372.

Surrette Storage Battery Co., Salem, Mass., batteries, $104,140.

Reading Batteries, Inc., Reading, Pa., batteries, $2,509,049.

United Motors Service Div., General Motors Corp., Detroit, batteries, $709,920; links, $33,400; bushings, caps, armature, $33,097.

Solar Corp., Milwaukee, Wis., batteries, $204,480.

Perrine Quality Products, Waltham, Mass., batteries, $812,120.

Gould National Batteries, St. Paul, Minn., batteries, $1,258,600.

Willard Storage Battery, Cleveland, batteries, $2,187,060.

E. W. Ferry Screw Products, Berea, Ohio, misc. screws, $323,125.

National Machine Products, Detroit, nuts, hexagon, $255,930.

White Machine Works, Eau Claire, Wis., sleeves, engine cylinder, $244,023.

Waukesha Motors, Waukesha, Wis., bearings, bushings, etc., $136,856; valves, washers, $87,427.

Diamond T Motor Car Co., Chicago, engines with accessories, $309,195; nuts, $29,922; winch & screw hoists, $34,855.

Allis-Chalmers Mfg., Milwaukee, shims, washers, pins, gaskets, $113,708; rods, gears, yokes, $37,860; pipes, $41,632; covers, roller, $339,194; nuts, plugs, screws, $47,595; plates, elbow, screen, $487,889.

Troy Sunshade Co., Troy, Ohio, windshields, $200,619.

Davey Compressor Co., Kent, Ohio, air compressors, $140,715.

Heintz Mfg. Co., Philadelphia, establish development and pilot line facility for producing cold extrusions with Navy-owned German presses, $325,000.

Gary Steel Products Corp., Norfolk, Va., spherical floats, $121,500.

Electric Storage Battery Co., Philadelphia, torpedo propulsion batteries, $1,231,400.

Watson-Stillman Co., Roselle, N. J., hydraulic cartridge crimping presses, 150-ton, $91,511.

(Continued on page 134)

Mergers and Purchases

• **Worthington Pump & Machinery Corp.**, Harrison, N. J., has purchased Wintroath Pumps, Inc., Alhambra, Calif., to be operated as a Worthington subsidiary. Boyd Kern will remain as president of Wintroath.

• **Pullman-Standard Car Mfg. Co.**, Hammond, Ind., has purchased the tractor allied equipment business of Isaacson Iron Works, Seattle and Rockford, Ill. Isaacson's tractor allied parts activity at Seattle will be transferred to Hammond. Operation of Isaacson's Rockford plant will be continued by Pullman-Standard.

• **Champlain Co., Inc.**, Bloomfield, N. J., has purchased Pickering Governor Co. from Hartford Empire Co., Hartford, Conn. All Pickering operations will be continued at the Champlain plant.

• **Pittsburgh Limestone Corp.** and Michigan Limestone & Chemical Co., two subsidiaries of United States Steel Corp., have been merged into a single operating subsidiary. The merged company will retain the name of Michigan Limestone & Chemical Co., with offices in the Guardian Bldg., Detroit.

• **Wellman Engineering Co.**, Cleveland, has purchased Anker-Holth Mfg. Co., Port Huron, Mich., makers of hydraulic and air-operated cylinders, chucks and collets, air valves and accessories. Anker-Holth will now become the Anker-Holth Div. of Wellman Engineering Co., with headquarters remaining in Port Huron.

• **Kenworth Metal Stamping Co.**, Milwaukee, has been purchased by John A. Evans from Nathan R. Cerf. Mr. Evans, new president and treasurer, had been employed by Allis-Chalmers Mfg. Co. as a project engineer in the electronics section.

• **General Metals Corp.**, Transamerica Corp. subsidiary, has purchased Pacific Fittings, Inc., San Francisco, to be operated as the Pacific Fittings Div. The firm makes pipe fittings.

STANDARDIZATION SEMINAR—To assist manufacturers in organization of their standardization work, a private five-day seminar will be held by Dr. John Gaillard, American Standards Assn., at Engineering Societies' Bldg., New York, Jan. 22-26. The seminar will consist of ten conferences, each comprising a lecture by Dr. Gaillard followed by round-table discussion.

TURBINE LOCOMOTIVES BOUGHT—Union Pacific Railroad has ordered ten gas turbine locomotives from General Electric Co., with delivery scheduled for late 1951. Similar to a 4500-hp unit which has undergone tests on regular freight runs for the last year and a half, the locomotive has few moving parts, uses low cost Bunker C oil. The locomotive's turbine is connected through reduction gears to electric generators. Top speed of the freight locomotives is 65 mph.

AUTO PLANT ENLARGED — Chrysler Corp. will triple the size of its Los Angeles assembly plant and will add 1200 new employees during 1951. Demand for cars on West Coast is reason. Present output is 400 cars a day.

AMERICAN ORDNANCE ASSOCIATION meeting last month in New York drew together Ed Godfrey, vice president, General Motors Corp. and newly elected director of AOA; Louis Polk, president, Sheffield Corp., and newly elected vice president in charge of Technical Divisions & Committees; General Clifton B. Cates, commandant, U. S. Marine Corps; and Col. James L. Walsh, AOA president

Die Casting to Expand Several Fold in Decade

NEW YORK — World-wide production of die castings will jump to a billion-dollar annual rate in 10 years, estimates H. H. Doehler, board chairman, Doehler-Jarvis Corp. Already output in this country has attained an annual rate of $250,000,000, according to figures of the American Die Casting Institute.

Mr. Doehler provided this estimate for the premier showing of a new film, "The Shortest Way," which will be made available to technical societies, users and students. In 27 min, the film carries the viewer from a round-up of many current applications, through the basic principles of die casting, redesign of products for application of the method, and modern means of casting and finishing. Particularly impressive to the viewer are vistas of many million dollars' worth of equipment in operation at the seven Doehler-Jarvis plants.

More Contracts; Douglas Aircraft Gets $97-Million Award

ARMY

Republic Steel Corp., Cleveland, misc. screws, $105,296.

Long Mfg. Div., Detroit, yoke, plate, lever, $32,292; disc, engine clutch assembly, $54,292.

Russell, Burdsall Co., Port Chester, N. Y., nuts, $38,500; screws, $41,172.

John E. Smith's Sons Co., Buffalo, machines, food chopping, $105,370.

Lonergan Mfg. Co., Albion, Mich., burners, oil stove, tent, $415,764.

Breese Burners, Inc., Santa Fe, N. M., burners, oil stove, tent, $225,488.

A-P Controls Corp., Milwaukee, valves, control, $140,035.

Winchester Repeating Arms Co., Div. of Olin Industries, Inc., New Haven, Conn., primers, non-corrosive, cal. 50, $276,750.

Enamel Products Co., Cleveland, forgings, steel body, for 75mm, $274,800.

Chase Brass & Copper Co., Waterbury, Conn., bands, rotating for 90mm shells, $95,220.

Food Machinery & Chemical Corp., John Bean Div., Lansing, Mich., apparatus, decontaminating, power driven, $186,002.

Lynch Brothers, Inc., Pine Meadow, Conn., practice bombs, 500-lb., $122,400.

Sharon Steel Corp., Sharon, Pa., steel, $176,090.

Weber Machine Corp., Rochester, N. Y., slide, assembly; piston, assembly, $116,974.

Cincinnati Coffin Co., caskets, burial, metal, seamless, $1,339,080.

AIR FORCE

Douglas Aircraft Co., Inc., Santa Monica, Calif., model airplanes and spare parts, $97,411,091.

Beech Aircraft Corp., Wichita, Kans., misc. assemblies, subassemblies, kits and spare parts for aircraft, $200,000.

Grand Central Aircraft Co., Glendale, Calif., overhaul of aircraft engines, $1,884,460.

Radioplane Co., Van Nuys, Calif., target aircraft spares, $3,632,370.

Walter Kidde & Co., Inc., Belleville, N.J., brackets for gun charger mounting, valve seats and gun chargers, $158,482.

Sperry Gyroscope Co., Great Neck, N.Y., compass components, $2,192,037; electron tubes, $151,230.

Harris-Seybold Co., Cleveland, printing presses, $602,539.

Cincinnati Milling & Grinding Machines, Inc., milling machines, horizontal, $251,636.

Jack & Heintz Precision Industries, Inc., Cleveland, generators, $240,000.

Grimes Mfg. Co., Urbana, Ohio, light assemblies, $96,352.

Gould-National Battery Co., Depew, N. Y., aircraft batteries, $136,358.

Electric Storage Battery Co., Cleveland, aircraft batteries, $228,856.

Westinghouse Electric Corp., Dayton, generators, $500,000.

Lockheed Aircraft Corp., Burbank, Calif., kits, misc. assemblies & subassemblies for aircraft, $100,000.

NAVY

Bucyrus-Erie Co., South Milwaukee, Wis., bullgraders, $120,301.

Federal Mfg. & Engrg. Corp., Brooklyn, N. Y., radio frequency standard generator, $201,354.

Bendix Radio Div., Bendix Aviation Corp., Towson, Md., direction finding equipment, $350,000.

J. D. Christian Engineers, San Francisco, cable reel, magnetic minesweeping; gearmotors, $150,000.

Joy Mfg. Co., Pittsburgh, vaneaxial fans, $438,718.

Federal Telephone & Radio Corp., Clifton, N. J., radio receivers, $800,000.

United States Hoffman Machinery Corp., New York, washing machines, $609,403.

Babcock & Wilcox Co., New York, superheater headers, plates and tubes, $100,000.

Diesel Engine Div., General Motors Corp., Detroit, conversion equipment kits, $500,000; generator sets, diesel-engine driven, $300,000.

Houston Blow Pipe & Sheet Metal Works, Houston, lockers, $199,560.

Handley Brown Heater Co., Jackson, Mich., reels, aircraft mooring, $146,980.

Westinghouse Electric Corp., Philadelphia, actuators, wing fold for F2H-2 aircraft, $220,880.

Kollsman Instrument Co., Div. of Square D Co., Elmhurst, N.Y., periscopic sextants, assembly mounts for aircraft, $199,705; tachometers, indicator parts, for aircraft, $25,507.

U.S. Rubber Co., Mishawaka, Ind., liner assembly for aircraft, $216,378.

Boeing Airplane Co., Seattle Div., spare parts for B-29 aircraft, $282,105.

Houde Engineering Div., Houdaille Hershey Corp., Buffalo, N.Y., dampers, shimmy, used on aircraft, $126,945.

Eclipse Pioneer Div., Bendix Aviation Corp., Teterboro, N.J., block assembly, altitude drop for use on automatic engine controls, $178,536.

Proportioners, Inc., Providence, R.I., Pur-O-Pumpers & reconditioned Pur-O-Pumpers, $99,870.

General Electric Co., Washington, D.C., spare parts, Ordnance Supply System list, $204,171.

Bogue Electric Mfg. Co., Paterson, N.J., motor generators, $122,460.

St. Pierce Chain Corp., Worcester, Mass., gears, vehicle, $1,132,134.

Bethlehem Steel Co., Shipbuilding Div., Quincy, Mass., planning services for conversion of Maritime Administration passenger vessels, $100,000.

Air King Products Co., Brooklyn, N. Y., wire recorders, $600,000.

American Blower Corp., Washington, D. C., forced draft fan, $100,000.

Teletype Corp., Chicago, teletypewriter equipment, $1,650,000.

Aluminum Co. of America, Washington, D. C., sheets, aluminum alloy, $107,919.

Jack & Heintz Precision Industries, Inc., Cleveland, starters, aircraft, direct cranking, $381,924; service and material to overhaul, repair and convert starter assemblies, $50,000.

Teterflex, Inc., Newark, N. J., lead assemblies for various ignition harness assemblies, $133,354.

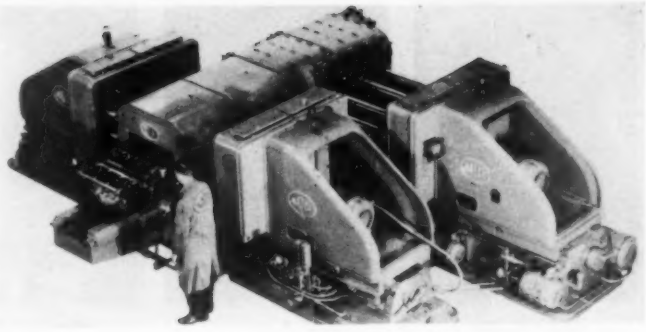
NATCO Observes 50th Anniversary

RICHMOND, Ind.—In 1901 six men from National Cash Register Co. developed a new type of drilling machine with multiple spindles and formed a new organization which since has grown into a huge builder of multiple spindle drillers and tappers. That new organization — National Automatic Tool Co., Inc.—this year celebrates its 50th anniversary.

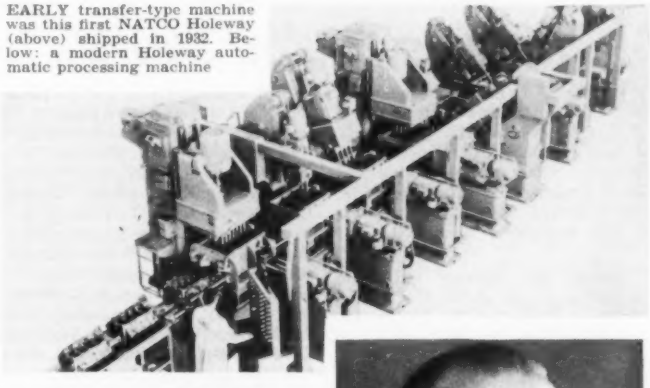
Starting in Dayton with 3500 sq ft of floor space, today buildings nearing completion will expand the NATCO plant to 254,000 sq ft.

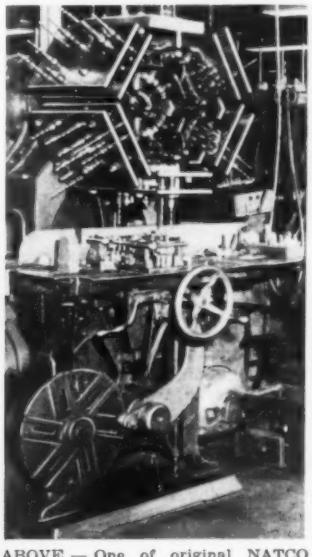
Some NATCO contributions to the industry: Introduced independent change of speed for each spindle; developed slip spindle plates and fixed center spindle boxes; pioneered use of rotating table; introduced multiple tapping with individual lead screws to each tap; pioneered application of hydraulic feed to multiple spindle drilling; first encouraged and adopted electric controls for machines and interlocking cycle phases; developed and installed one of the first processing or transfer type machines.

President of NATCO is Harry Bockhoff, who took over in 1928 upon the death of his father, Wm. F. Bockhoff. Other officers: Edward D. Frank, vice president, director and sales manager; Erma B. Hunt, operating vice president and director; R. C. Schuerman, treasurer and director; Allen B. McCrea, secretary.



EARLY transfer-type machine was this first NATCO Holeway (above) shipped in 1932. Below: a modern Holeway automatic processing machine





ABOVE — One of original NATCO automatic spindle drilling machines with hex heads still at work on modern cash registers, producing 60 side frames per hour

LEFT—In the same plant, a modern NATCO machine drills and step reams cash register key frame to .001

HARRY BOCKHOFF, president and chairman of NATCO

EDWARD D. FRANK, vice president, director, and sales manager

George H. Lynn

C. B. Cook

Elmer F. Twyman

Kenneth R. Arvedon

Names in the News

George H. Lynn has been named general sales manager of Hamilton Div., Baldwin-Lima-Hamilton Corp., Hamilton, Ohio. He joined Lima-Hamilton Corp. in 1947 as western district manager in Chicago for Niles Tool Works Div., and Hooven, Owens, Rentschler Div.

George W. Morrow has been named in charge of the central and southern district of the Power Ballaster Products Div., Pullman-Standard Car Mfg. Co., Chicago; **John B. Bell** has been named in charge of the northeastern district, and **Robert C. Caldwell** in charge of the south and southwestern sales.

Max Greenberg has been named consultant to the Chief of Ordnance, Dept. of the Army, in connection with procurement pricing. During World War II he was a member of the Contract Board of Awards, and in charge of price analysis work of the New York Ordnance district. During World War I he was a member of the War Industries Board. For the present he will divide his time between Washington, New York and the various Army Ordnance Procurement establishments.

Robert L. Coe has been elected board chairman, Chase Brass & Copper Co., Inc., Waterbury, Conn. **Richard C. Diehl,** former general manager of the Steubenville, Ohio, plants of Wheeling Steel Corp., was elected to succeed Mr. Coe as president.

Stanley M. Tracy, executive vice president, Driver-Harris Co., Harrison, N. J., has completed 40 years of service with the company. He started as a cost clerk at the Harrison plant in 1910.

C. B. Cook has been elected president, and **Elmer F. Twyman,** vice president, of Electric Industrial Truck Association for 1951. Mr. Cook is vice president and export sales manager of Elwell-Parker Electric Co., Cleveland. Mr. Twyman is vice president in charge of the Philadelphia Div., Yale & Towne Mfg. Co. Members of the association's executive committee will be: **J. A. Baldinger,** assistant general manager, Yale & Towne, Philadelphia Division; **Gordon J. Berry,** vice president, Electric Products Co., Cleveland, and **M. W. Heinritz,** vice president, Gould-National Batteries, Inc. Mr. Heinritz is outgoing president.

William G. Mahlman, for three years supervisor of order analysis for both Edward and Nordstrom valves, has been named sales office manager, Edward Valves, Inc., East Chicago, Ind. He succeeds **Herbert J. Rowe,** who has been called back to the U.S. Marine Corps.

Charles E. Newman has been named sales engineer for the Chicago territory of Surface Combustion Corp., Toledo.

Dr. John W. McNall has been named division engineer, Research Dept., Westinghouse Lamp Div., Bloomfield, N. J.

A. Alven has been named general sales manager, Lipe-Rollway Corp., Syracuse, N. Y. He has been general sales manager of the subsidiary Rollway Bearing Co., Inc.

Lyman H. Allen, Jr., formerly assistant chief design engineer in charge of chemical process design with American Viscose Corp., Philadelphia, has been named chief engineer, Foster D. Snell, Inc., New York.

Kenneth R. Arvedon has been named field secretary of National Tool & Die Manufacturers Association. He will aid and service members in the New York metropolitan area for both the national association and the New York Tool & Die Institute, with offices at 17 East 42nd St. Mr. Arvedon was formerly executive secretary of Vesti (Veterans Employment Service of the Textile Industry).

Donald M. McGrath has been named general manager, Red Bank Div., Bendix Aviation Corp., Red Bank, N. J. He has been assistant director of sales and service for Eclipse-Pioneer Div. at Teterboro, N. J. He succeeds **W. W. Fisher,** who has been named general manager of a newly created division at Davenport, Iowa. Mr. McGrath has specialized in that phase of Eclipse-Pioneer's work involving the ordnance and aircraft engine fields.

Earl P. Leeds and **James Meehan,** who have been connected with the sales department of Brown & Sharpe Mfg. Co., Providence, have been appointed sales directors.

John A. Bukowski has been named general superintendent, Atlas Foundry Co. and Atlas Stainless Steel Co., Irvington, N. J. He was formerly with Worthington Pump Co., Harrison, N. J., as works metallurgist.

E. F. Hackett has been named eastern district sales manager, Pacific Steel Boiler Div., United States Radiator Corp. The division has taken new and larger offices at 101 Park Ave., New York.

C. N. Sugden has been named assistant director of engineering for gages and instruments, Manning, Maxwell & Moore, Inc., Bridgeport, Conn. **Robert Ingham** succeeds Mr. Sugden as chief engineer for gages.

Roy J. Dusseau

L. W. Jander

Charles L. Hardy

Casimir S. Kopec

Roy J. Dusseau has been named district manager in charge of the Dayton office, E. W. Bliss Co., Canton, Ohio. Before joining Bliss, Mr. Dusseau was with Meisel Machine & Tool Co., Toledo, as general manager. Prior to that he was president and owner of Dusseau Die Service Co., Toledo. He also has been associated with Avco Tool & Machine Co., American Propeller Corp., and Northern Aircraft Products Co. **C. R. Brown** has been named purchasing manager, Canton Div. He rejoins Bliss after a brief association with Robert Carter Co., Toledo. He had been with Bliss for 17 years previously.

H. L. Disco and **E. R. Koester** have been named assistant managers of manufacturing, General Electric Company's Appliance & Merchandise Dept., Bridgeport, Conn. **G. F. Kelley** has been named manager of manufacturing engineering, and **C. A. Rystogi** assistant manager of manufacturing, Household Refrigertor Div., Erie, Pa. New Refrigerator Div. superintendents are **E. J. Fisher,** in charge of the refrigerator unit section; **M. F. Payne,** refrigerator cabinet section; **G. J. Kane,** freezer section.

C. Carlisle Tippit, manager of the order and planning department of Reliance Electric & Engineering Co., Cleveland, since 1948, has been appointed general purchasing agent. **Walter H. Behnke** succeeds **Mr. Tippit** in his previous position.

C. Edwin Ponkey has been named general manager, International Derrick & Equipment Co., Columbus (Ohio) Div. He resigned as vice president, Sheldrick Mfg. Corp., to accept the position. He succeeds **Ferguson Barnes,** resigned. Mr. Ponkey was with Ex-Cell-O Corp. for 20 years before joining Sheldrick in 1946.

L. W. Jander has been named sales manager, Industrial Div., Henry Disston & Sons, Inc., Philadelphia. He succeeds **J. F. Wilkinson,** who has resigned to enter his own industrial distributing business in Miami, Fla. Since 1947 Mr. Jander has been in charge of Disston's eastern sales division operations.

Charles L. Hardy has been elected president of Joseph T. Ryerson & Son, Inc., Chicago, succeeding Everett D. Graff, named chairman of the executive committee. **Thomas Z. Hayward** was elected vice president, sales. Mr. Hardy, formerly assistant to the president, joined the Ryerson Boston plant organization in 1927.

Wilbur R. Leopold has been named assistant vice president, Worthington Pump & Machinery Corp., Harrison, N. J., and will function on public works projects. He was formerly manager of the Detroit office. **Clarence S. Wentworth** has been named to fill that post.

A. W. Plier has been elected executive vice president and general manager, D. J. Murray Mfg. Co., Wausau, Wis. **D. J. Everest** has been elected vice president; **C. L. Durkee,** director, vice president, and sales manager; **W. A. Marquardt,** secretary; **P. W. Hoeper,** assistant secretary; and **Grover Keeth,** assistant treasurer.

Casimir S. Kopec has joined the staff of American Gear Manufacturer's Association as staff engineer. He will devote full time to development of the association's technical literature. Previously he was with General Motors Corp and Ford Motor Co. Research Laboratories specializing in gear design.

F. C. Helms, Jr., has been named midwest branch manager, Morse Twist Drill & Machine Co., New Bedford, Mass., a division of Van Norman Co., Springfield, Mass. His headquarters will be at the new Morse office at 571 West Randolph St., Chicago. He succeeds **Charles F. Myers,** recently named sales manager, with his office in New Bedford. **Norman S. Fagerson** has been named Morse representative in the Chicago area, succeeding **M. P. Lansing,** who now represents Morse in Texas. **C. F. Duff** has been named district manager of Ohio and Indiana. He formerly represented in Cleveland. Morse is now represented in Mr. Duff's territory by **A. E. Boot** and **Harold Symes.**

Evan Price has been named turbine sales manager, Whiton Machine Co., New London, Conn. He was formerly in charge of turbine sales of Kissick Co., New York.

Roger H. Brown has been named eastern sales manager, ICB Div., Warner Electric Brake & Clutch Co., Beloit, Wis.

OBITUARIES

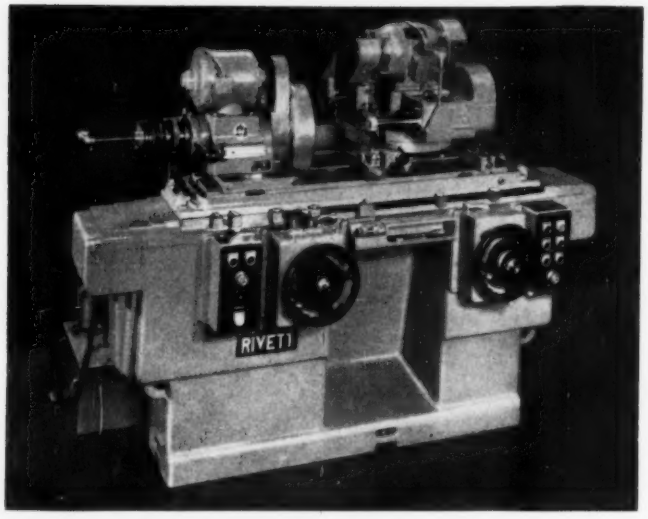
G. Walter Sanborn, vice president in charge of purchasing and traffic, United Engineering & Foundry Co., Pittsburgh, died Dec. 15.

John P. Hoelzel, 67, president, Pittsburgh Screw & Bolt Corp., died Dec. 26. He joined the firm as a young man, was named president in 1939.

Edwin G. Schill, 67, vice president, Kent-Owens Machine Co., Toledo, died Dec. 11. He joined the firm as an apprentice machinist 50 years ago.

Edward Lindmueller, 74, consulting engineer, died Dec. 18 after a heart attack suffered in rooms of the Cleveland Engineering Society.

New Shop Equipment



Rivett Universal Grinder Eliminates Dual Setups

A universal wheelhead features a hydraulic grinder made by Rivett. Swiveling 180° and mounting both internal and external spindles, the wheelhead is designed to eliminate dual work setups for internal and external grinding. The operator can present either spindle to the same work.

Draw-in collets and step chucks are mounted directly in the work-head; increasing chucking speeds.

Other features are: internal spindle speeds from 6000 to 35,000 rpm; all spindles flange mounted, sealed from grit and life lubricated; external spindle with double-row roller bearings for radial load and ball bearings for end thrust; micrometer table stop and fine feed for shoulder and blind-hole grinding; sine bar for setting workhead on table swivel for tapers; double swivels on cross-slide for two-angle internal and external grinding. All the grinding-wheel feed controls are at the operator's right hand with all table-traverse controls at the operator's left hand.

Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass.

(MORE DATA? CIRCLE FYI 31, p. 147)

Starrett Slide Caliper Put Out in 6-in. Size

Formerly available only in 3- and 5-in. sizes, the 6-inch model has capacity for measuring outside dimensions or diameters up to $4\frac{3}{4}$ in., and inside dimensions from $\frac{1}{4}$ to 5 in. Separate machine-graduated scales on the slide provide for measuring in either 32nds or 64ths of an inch. The reverse side of the stock is graduated with a handy 6-inch scale in 32nds of an inch.

Material used is of high-grade stainless steel. The jaws are designed with straight inside surfaces for measuring outside diameters and with rounded nibes for accurate measuring of holes. A knurled thumb piece on the slide facilitates opening and closing of the jaws. The slide can be locked at any position by a knurled clamping screw having a left-hand thread.

The L. S. Starrett Company, Athol, Mass.

(MORE DATA? CIRCLE FYI 32, p. 147)

Manco Bolt Cutter Is 60% Lighter

This 15-in. bolt cutter is said to have a capacity equal to that of a standard 18-in. cutter.

Tool steel is used for the jaws, with 14-gage steel stock being used for the handles. It has a gunmetal-blue finish for rust inhibiting, with all under surfaces blued before assembly. The jaws are said to be unsually tough.

Manco Mfg. Co., Bradley, Ill.

(MORE DATA? CIRCLE FYI 33, p. 147)

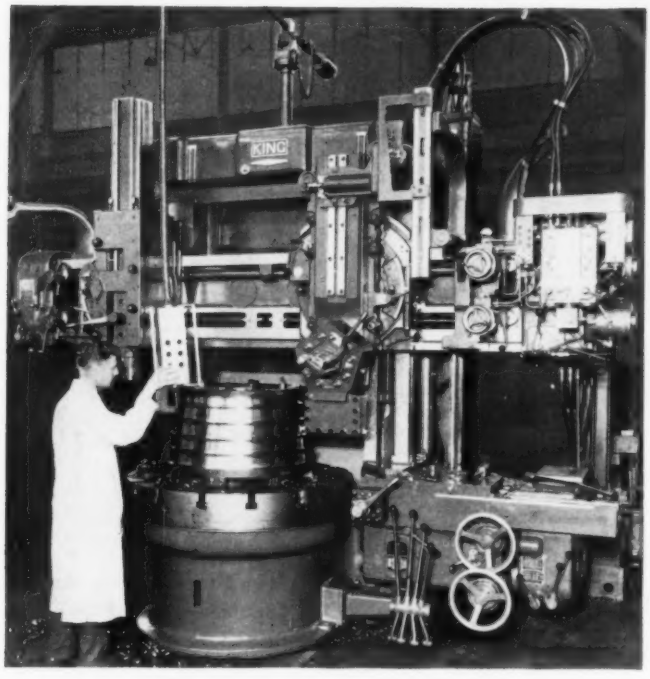
Vitrified Bond Steps Up Grinding Output

Called 79E, this bond is recommended for the portable grinding of such work as billets, forgings and forging dies, centers, and stainless-steel welds. It is claimed to assure a smoother, faster cutting action for vitrified grinding wheels operated at speeds up to 6,000 sfpm.

Chicago Wheel & Mfg. Co., Chicago, Ill.

(MORE DATA? CIRCLE FYI 34, p. 147)

Materials and Parts



King Boring Mill with Tracer Speeds Jet-Engine Production

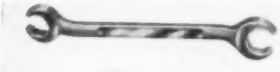
This 52-in. vertical boring and turning machine with hydraulically controlled tracer attachments is being used for the production of jet engines.

In addition to the tracer attachment, the machine has a swivel turret head and a four-way tool block on the left-hand ram head. The one machine combines automatic contouring and manual roughing with automatic depth control. By shifting one lever the contouring attachment can be disconnected and the machine can then be used as a standard mill.

Extra weight and rigidity is said to assure dependable accuracy and maximum stock removal at high speeds. All controls are located at the front of the machine, accessible to the operator. Ten sizes are available from 30 to 144 in.

King Machine Tool Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio.

(MORE DATA? CIRCLE FYI 35, p. 147)



OTC Flare-Nut Wrenches Made with Hex Openings

The hex openings on these wrenches are said to provide a better bite and to prevent turning the corners on soft brass nuts found on copper lines. They are drop-forged from high alloy steel, and are fully heat-treated with a chrome-plated finish.

Owatonna Tool Co., 383 North Cedar Street, Owatonna, Minn.

(MORE DATA? CIRCLE FYI 36, p. 147)

... INCLUDING

Surface grinder can be equipped with either a plain or rotary table .....page 140

Vertical miller has a head adjustable in two planes; 45° across the table and 90° parallel with the table axis.....page 140

Punch and die sets are available in box and twin-plate assemblies, cutting setup time.....page 141

Column clamp for radial drills uses electro-hydraulic power to actuate the clamping.....page 146

Piston grinder rocks the work about the footstock to obtain a taper .....page 150

Chip remover loads work on a platform that moves up and down through the solution....page 154

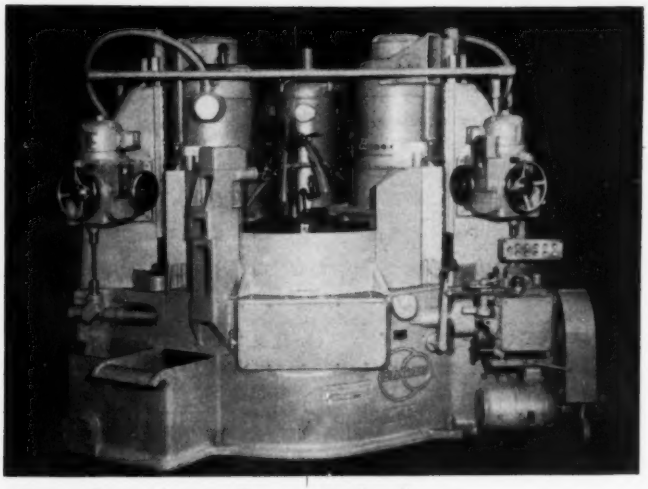
Carburizing furnace controls the carbon content of the atmosphere automatically .....page 158

Molding press with two transfer rams molds rubber parts around metal inserts.....page 152

NEW BULLETINS for Your Shop Library, including a 56-page manual dealing with overhead materials handling..pages 147 and 148

... and in January 22

PRODUCTION PREVIEW issue of *AM*, which illustrates and describes the 1500 or more items which have appeared in the New Shop Equipment section during the past year.



Blanchard Surface Grinder Equipped with Three Spindles

The No. 16A3 rotary-table grinder can be equipped with a magnetic chuck 40 in. in diameter. A plain table may also be used to accommodate fixtures for holding nonmagnetic work or pieces of irregular shape. Maximum swing is 49 in.

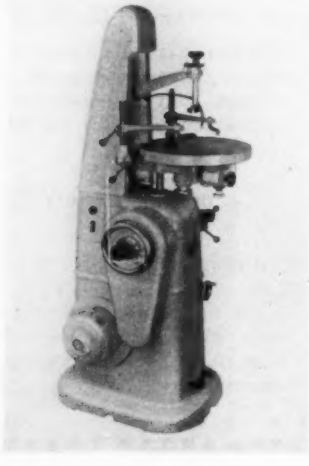
The grinder is equipped with three abrasive wheels. All three wheels can be set to grind the same surface, when stock removal is heavy or where very accurate tolerances for dimension or surface finish are required. Or, one spindle can be set to grind a surface at the same or different height, at a different distance from the center of the chuck.

The grinder illustrated is equipped with two spindles driven by 30-hp motors and one driven by a 15-hp motor. It is equipped with a 24-station fixture arranged for automatic clamping and releasing, and is for grinding connecting rods with the wrist-pin boss at an offset height.

All grinding wheels are under the control of an automatic caliper, or sizing device, which will, in ordinary practice, hold dimension variations within a total range of 0.001 in.

The Blanchard Machine Co., Cambridge, Mass.

(MORE DATA? CIRCLE FYI 37, p. 147)



Williams Die-Making Machine Has Fully Enclosed Transmission

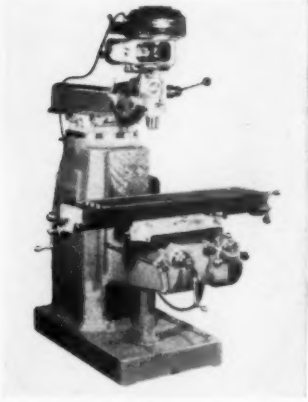
This machine is used for final finishing operations on metal-stamping or power-press punches and dies and also on dies for extruding metals. An Axial air-gap motor is used—½ hp, 1800 rpm. A flange on the base will take other standard horizontal-shaft motors.

The variable-speed transmission is fully enclosed, and operated from a conveniently placed dial and handle to provide 75 to 350 strokes per minute of the operating shafts. The main-drive mechanism uses a segment and gear control and a throw-out clutch to ease stroke adjustment for the operator. A splash lubricating system for the drive insures quiet operation and cushioning effect.

A pedal gives instant control of operation. Other standard features are: a compound tilting table with vernier-scale reading, 5-in. stroke and table adjustment, and a heavy 17-in.-diameter counterbalanced table. Includes attachment for light and heavy compression and tension files, holders and guides for fine or jewelers saws, honing or stoning adapters.

Connecticut Tool & Engineering Co., 5¼ Iranistan Ave., Bridgeport 5, Conn.

(MORE DATA? CIRCLE FYI 38, p. 147)



Head on Vertical Milling Machine Is Adjustable in Two Planes

Designated as the No. 2 UV, this milling machine is claimed to have the rigidity, weight and range of a No. 2 size machine as well as a universal vertical head. It can be used for angle milling, drilling, and boring.

The head can be moved from a vertical position across the table, a total of 45° each way. This permits angular milling cuts the length of the longitudinal tablefeed without resetting. The head can also be rotated 90° each way in a plane parallel with the table axis. A 1-hp axial air-gap motor is provided to power the spindle at speeds ranging from 140 to 3500 rpm, or from 210 to 5200 rpm. Capacity of the head ranges from ⅛- to 1½-in. end mills.

The spindle is mounted in sealed-preloaded ball bearings. The quill and spindle are hardened and ground. A counterbalance makes either hand or power operation of the quill sensitive throughout the 4-in. travel.

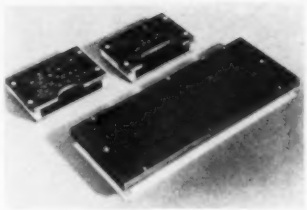
An automatic collet-closing mechanism is used for holding tools and cutters. It is said to assure tool holding without slippage. Other features of the head are power down feed

to the quill, enclosed micrometer depth stop, and positive quill lock.

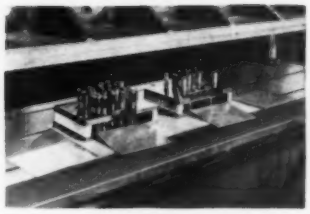
A built-in feedbox provides five rates of feed and rapid traverse to the longitudinal table movement. The feeds are ¾, 1⅜, 2⅜, 4, and 7 ipm, and the rapid traverse is 70 ipm. The drive is through a safety device which prevents damage to the screw or gearing when an obstruction is encountered.

The Tree Tool and Die Works, Racine, Wis.

(MORE DATA? CIRCLE FYI 39, p. 147)



Box and twin-plate units for inserting punches and dies. Twin plate in foreground has support rail.



Two box setups on press bed perform progressive operations on the same piece of work.

Wales Punch & Die Units Cut Setup Time

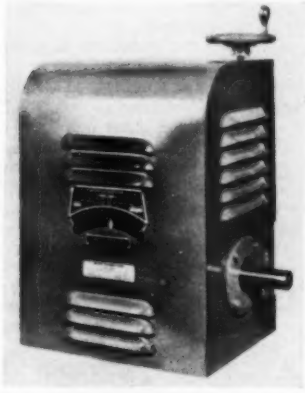
This multiple-hole-punching system is said to provide a simpler, faster, and more economical method of punching holes in sheet-metal parts by permitting the entire setup to be made outside the stamping press or press brake. The punch and die units are interchangeable, permitting the same units to be used and reused in an infinite number of setups. The punches and dies are used with either box plates or twin plates. The box assemblies are self-contained for punching small parts up to 21x23 in., and twin-plate assemblies are for punching larger parts up to 44x92 in. Holes are located and drilled in both the plates with a master templet as a pattern.

When using the box-type setups, nothing is attached to the ram. Press-down time is reduced to the few seconds required to lift one set-up from the press and replace it with another. During the run, punches may be replaced instantly without disturbing the setup and without any adjustments.

When using the twin plates, the punch plate with punches inserted in the holes is fastened to the press ram and the die plate is bolted to the bed. This setup provides ample daylight opening for easy feeding and removing of the work.

Wales-Strippit Corp., 345 Payne Ave., North Tonawanda, N.Y.

(MORE DATA? CIRCLE FYI 41, p. 147)



Worthington Variable-Speed Drive Maintains Shafts in Alignment

A transmission series, incorporating a tandem-belt design, will consist of six models rated at 1, 3, 5, 7½, 10 and 15 hp. Variations of 16 to 1, 10 to 1, 9 to 1, 8 to 1, 6 to 1, and 6 to 1 respectively, are offered. At 1725 rpm input, the 1-hp. unit offers a range of 215 to 3450 rpm; while the 15 hp. unit will vary from 370 to 2220 rpm with an input speed of 1750 rpm.

Due to the tandem-belt design, the unit is said to be particularly suited to applications where space limitations require compactness. It can be furnished for vertical or horizontal operations, to run in either direction. Handwheel control is normally furnished. Electric remote controls are available where required.

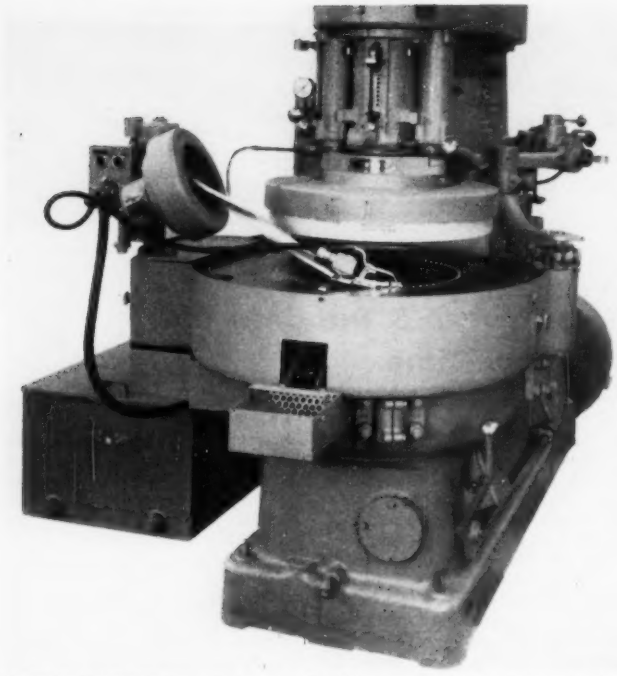
Some features: wide-spaced bearings maintain the input and output shafts in alignment, regardless of belt tension load. All rotary motion is carried in shielded ball bearings, lubricated for life. All sliding fits are made with easily removable bronze-composition bushings.

Worthington Pump & Machinery Corp., Allspeed Drive Div., Holyoke, Mass.

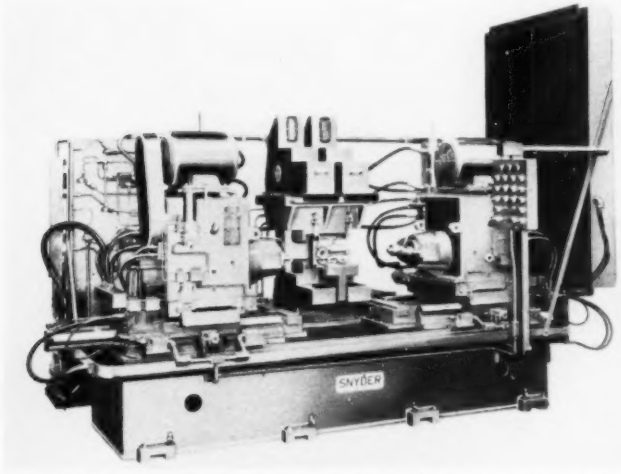
(MORE DATA? CIRCLE FYI 40, p. 147)

GRINDER for slitter knives is equipped with an automatic wheel feed and includes a rapid infeed and retraction for wheel clearance and loading. The workhead is mounted on an adjustable double cross-slide to position the work properly. — *Landis Tool Co., Waynesboro, Pa.*

(MORE DATA? CIRCLE FYI 42, p. 147)



LAPPING MACHINE uses equipment which can automatically load and unload small flat parts continuously. At the upper left is the hopper which picks up the parts and passes them into the spiral feeding trough. The parts, in this case, washers, are then sent by gravity down the loading chute to the finger-loading mechanism which places each washer into the empty workholder holes. — *Norton Co., Worcester, Mass.* (MORE DATA? CIRCLE FYI 43, p. 147)



BALANCING MACHINE mills connecting rods to within less than 2-grams variation in over-all weight, with a production rate of 144 pieces an hour at 80% efficiency. Operation is entirely automatic after locating the workpiece and pressing the cycle button. The workpiece is automatically weighed and the scales register the amount each end is out of balance. They then transmit signals to the milling units. — *Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit, Mich.* (MORE DATA? CIRCLE FYI 44, p. 147)

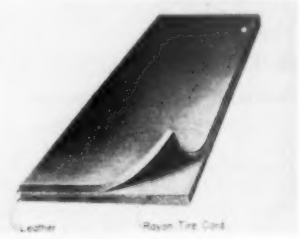
Portable Arc Welder Uses Solderless Connectors

Features claimed for this welder include: solderless connectors throughout; greater ease of striking arc; spun-glass-insulated transformer; simplified terminal control; and fully insulated terminals.

Known as the Model 125 A, it has 16 heat stages ranging from 20 to 125 amps. It handles from 1/16 to 5/32-in. welding rod and handles iron, steel, brass, bronze and other metals in a wide range of gages. The equipment includes a head shield, electrode holder, ground clamp, cables, a supply of welding rods, and operating instructions.

Trindl Products, Ltd., 17 E. 23rd St., Chicago 16, Ill.

(MORE DATA? CIRCLE FYI 45, p. 147)



Schieren Flat Leather Belt Has Rayon-Cord Insert

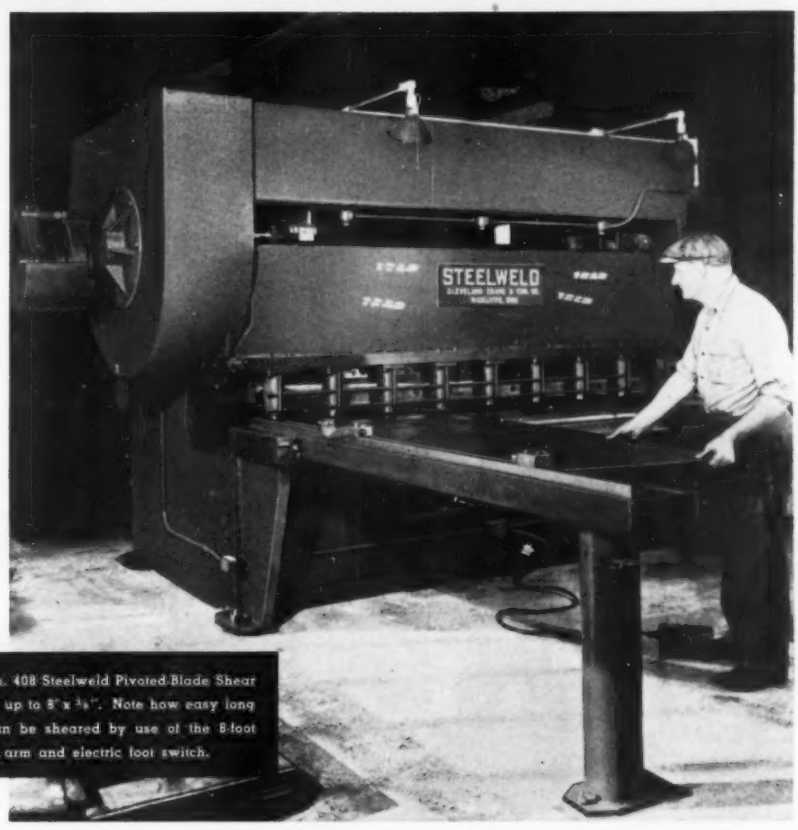
Consisting of a layer of rayon tire cord cemented between two layers of Duxbak leather belting, this product is said to assure stretch resistance. The belt may be scarfed and made endless with the same ease and the same method as any other flat leather belt. Regular belt fasteners or lacing can be used in the customary manner.

It is claimed that operators of metal planers will find one of these belts will improve the performance of the planer, particularly on the reversing bed where it is desirable to reverse the bed as fast as possible in order to get the maximum number of strokes per hour.

Chas. A. Schieren Co., New York, N. Y.

(MORE DATA? CIRCLE FYI 46, p. 147)

likes EASY KNIFE ADJUSTMENT



Series No. 408 Steelweld Pivoted Blade Shear for metal up to 8' x 3/8". Note how easy long plates can be sheared by use of the 8-foot squaring arm and electric foot switch.

The easy knife clearance adjustment is one of the features that Johnston & Chapman Co., Chicago, greatly appreciates about their Steelweld Shear. Since they produce perforated metal of various thicknesses, which must have sharp, burrless edges, it is essential that the knives always be set with the right clearance to make the best possible cuts.

This company has had over 50 years of experience in shearing. They point out that if the knife clearance is too much, light gauge metals will bend, and if too close, a shear is unnecessarily heavily loaded and the knives dull rapidly.

The knife gap of their Steelweld Shear is adjusted in a few seconds by simply turning the crank conveniently located on the right end frame. The ease and simplicity of this adjustment is impressive when compared to other shears which require the entire bed be moved and gap be set by feeler gauges.

Johnston & Chapman supply perforated metal for all sorts of purposes, including screening for coal and for television equipment. Their shear is used for cutting mild steel, stainless steel, brass and other metals from 28 gauge to 3/8 inch thick.

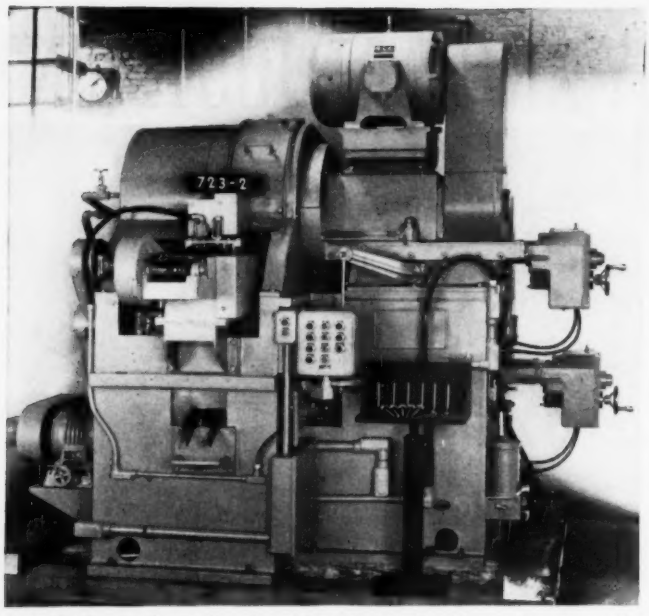
GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

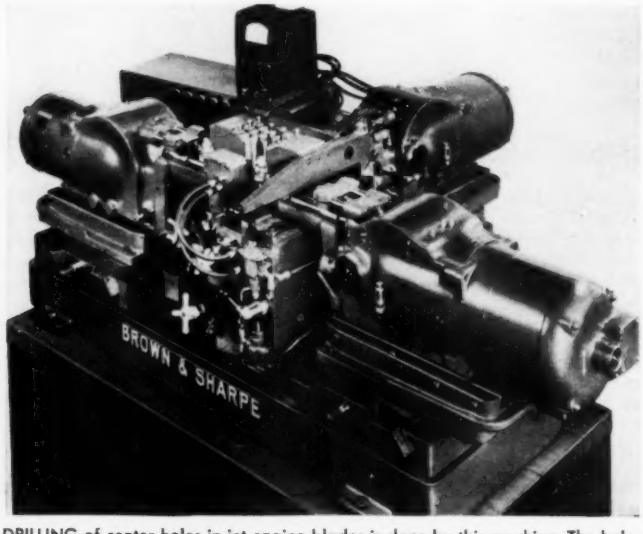
THE CLEVELAND CRANE & ENGINEERING CO.

1423 EAST 282nd ST. WICKLIFFE, OHIO

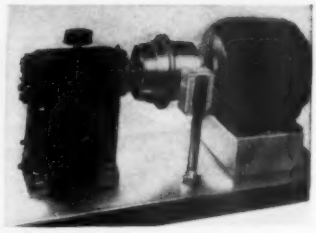
STEELWELD PIVOTED BLADE SHEARS



GRINDER for rough grinding the ends of hardened exhaust-valve stems. The machine has two heads, each mounting a 23-in. grinding wheel, one slightly below and to the rear of the other. One wheel removes the major portion of the stock and the remainder is removed with the second. Valves are fed past the wheels by a rotating carrier having 20 automatic clamping fixtures. *— Gardner Machine Co., Beloit, Wis.* (MORE DATA? CIRCLE FYI 47, p. 147)



DRILLING of center holes in jet-engine blades is done by this machine. The holes are used for location purposes. The blade is supported in a non-frictional reed-mounted cradle arranged to adjustably pivot about two axes, and to be adjustable vertically. Proper positioning is effected by observation of six strain-gage indicator points in contact with the airfoil surface. *—Brown & Sharpe Mfg. Co., Providence 1, R.I.* (MORE DATA? CIRCLE FYI 48, p. 147)



Anchor Cut-Out Couplings Provide Overload Protection

This automatic device for machine tools, processing equipment, conveyors, etc., instantly shuts off the power when an overload occurs and resets itself automatically.

It combines the features of a flexible coupling with the torque sensitive protection of the company's cut-out pulley. The couplings are furnished in two sizes, and the working range is from 20 to 10,000 in.-lb. torque.

Anchor Steel and Conveyor Co., 6906 Kingsley Ave., Dearborn, Mich.
(MORE DATA? CIRCLE FYI 49, p. 147)

Weld Discoloration Removed From Stainless by Simple Process

The only parts needed in this process are a small amount of acid solution to cover the discolored area, a copper rod, a dc power source, and electrical connections. The method is especially useful in removing discoloration in hard-to-get-at interior corners.

A copper rod of about ¼-in. diameter is bent to a convenient shape. Short pieces of rubber tubing are placed on the rod to keep it from touching the stainless and shorting the electrical circuit. Only enough 50% phosphoric acid is poured into the welded corner to contact the rod and wet the discolored area.

The copper rod is connected to the negative terminal of the source and the stainless part to the positive terminal. Then the copper rod is passed along the joint to be cleaned. The discoloration is removed quickly; the rod can be moved at a rate of about 2 ft. per minute.

Armco Steel Corp., Middletown, Ohio
(MORE DATA? CIRCLE FYI 50, p. 147)

It's amazing what you can do

in one draw...

MAGNESIUM

8½ inch draw in one operation!

This radar container, 15 inches long by 10½ inches wide, was drawn to its full depth of 8½ inches in one draw from ⅛ inch magnesium stock.

Production men unfamiliar with magnesium are usually surprised at the drawability of the material. While it isn't quite so easy to draw as pictured above, the practice of hot forming magnesium does permit deformations impossible in any other metal.

Generally speaking, magnesium alloys can be hot drawn in one operation to a depth equal to 80% reduction in blank size. This often eliminates the need for multiple stage dies, speeds up the operation, and reduces processing costs even though pre-heating of the sheet and dies is required. Since hot forming is used, spring-back problems are greatly reduced.

Almost any press found in the ordinary press shop can be used to draw magnesium, although hydraulic presses are preferred when the draw is severe and controlled speeds are required. Dies are similar to those used on other metals.

For additional information on drawing or forming magnesium, call your nearest Dow sales office or write direct.

Magnesium Division, Dept. MG-41

THE DOW CHEMICAL COMPANY

MIDLAND MICHIGAN

New York • Boston • Philadelphia • Washington • Atlanta • Cleveland • Detroit
Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle
Dow Chemical of Canada, Limited, Toronto, Canada

Small-Size Cabinet for Liquid Blast Cleaning

A wide range of abrasive sizes down to as fine as 5,000 mesh are used in this cabinet. There is claimed to be no breakdown of corners and tolerances can be held to within 0.0001 in.

The cabinet is constructed of one-piece aluminum casting and is equipped with lighting, armholes, air filter, exhaust fan, and vision window. A detachable abrasive hopper allows easy cleaning.

Water, fine non-metallic abrasives and compressed air are used to clean and finish a wide range of work. Inside diameter is 15 in. and floor space required is only 17x22½ in.

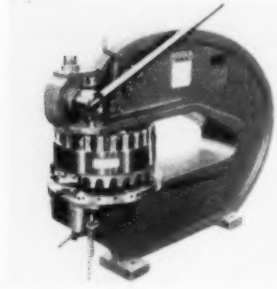
Pangborn Corp., Hagerstown, Md.
(MORE DATA? CIRCLE FYI 51, p. 147)

Appton Chipping Hammer Can Control Force of Blow

Powerful air tool can be used for drilling, chipping, riveting and other applications.

The hammer is small in size, measuring 9½ in. overall, and has a 1-in. diameter piston. Its no-trigger construction combined with its 5-lb. weight is claimed to make for safe, easy handling. The hammer operates when pressed into contact with the work, stops when withdrawn. It is able to control the force of the blow, from a light tap for delicate work to full power for heavy applications. Operates on pressures from 30 to 100 lb.

The Burgess Thomas Co., Department R, Box 287, Bloomfield, N. J.
(MORE DATA? CIRCLE FYI 52, p. 147)



Rotex Punch Press Handles 48-In.-Wide Sheets

The 24-in. throat, Model 18B punch press has a rotary turret which permits the operator to quickly locate any one of 18 desired punch sizes. After rotating, it locks in position automatically.

The 18 stations can be furnished in 5/64- to 2-in. sizes for cardboard, fiberboard, plastic, or sheet iron up to 10-gage thickness. A safety lock prevents damage to the work, punches or dies if machine is not properly aligned.

Rotex Punch Co., 4726 E. 12th St., Oakland, Calif.
(MORE DATA? CIRCLE FYI 53, p. 147)

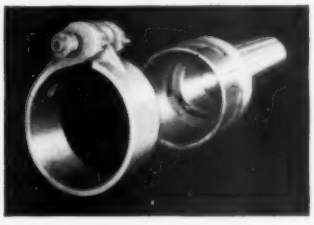
Sterod Steam-Vapor Cleaner Is Automatically Controlled

An automatic system enables one-man operation of this cleaner. At the snap of a switch a spark is generated which ignites the burner and puts the machine in action. From this point on, fully automatic controls maintain the operation without adjustment.

The entire system is automatically protected from excessive pressures at three independent points. A mechanical outside safety valve is provided as a check on the electrical limit switch and by-pass valve. Heating coils are protected by a control which stops the entire unit should the water supply fail or become inadequate. The electrical system is protected by an overload switch.

Another feature is a burner which will burn almost any kind of fuel. It can operate on kerosene, No. 1 and No. 2 fuel oil, light diesel oil, and also crankcase, transmission and rear axle drainings without adjustment. Available in stationary or portable models of 100 or 200 gal. capacity. Powered by ½ or ¾ hp motor.

General Equipment Div., Sterod Manufacturing Co., 444 Frelinghuysen Ave., Newark 5, N. J.
(MORE DATA? CIRCLE FYI 54, p. 147)



Radial Drill Column Clamp Permits Lower Speeds, Feeds

Device for Carlton radial drills consists of a steel clamping ring (with eccentric for applying pressure) and a collet-type outer column. The column can be quickly clamped and unclamped by means of electric push-buttons in the head.

Electro-hydraulic power is used to actuate a mechanical method of clamping. Once the column is clamped or unclamped, the mechanical device holds it in position until the power is supplied again. This results in savings in electric-power consumption and eliminates maintaining high pressure in the hydraulic system.

The clamp is said to give 20% more rigidity than previous designs. The clamping ring takes a bearing on the outer column and holds it rigidly in place with a maximum spindle displacement of 0.001 in.

Better finished surfaces are said to result because lower speeds and feeds can be used — since the resonant vibrating point is 1½ times higher than on previous models.

The Carlton Machine Tool Co., Cincinnati 25, Ohio.
(MORE DATA? CIRCLE FYI 55, p. 147)

FYI

FOR YOUR INFORMATION

FREE details about new machines & tools
FREE data on new materials or parts
FREE shop calculators and data sheets
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FYI – these initials symbolize information that's important. We use them, too, to head our expanded reader service. Here are two postcards which will bring you new literature, bulletins on new equipment, materials or parts, further information from any advertiser, or advice from editors – for a 3-cent stamp.

ALL YOU DO is circle on the lower card the number of any shop equipment item about which you want more data or any piece of manufacturer's literature of which you want a copy.

For details on an advertised product, write the page number in one of the boxes provided, adding the advertiser's initials if more than one advertisement appears on the page – if the page is unnumbered, as a cover or insert, or the ad shows several products, use initials and write in the product name. Fill in your name, title and address, cut out the card, add a 3-cent stamp and mail. We do the rest, saving you time, trouble and money.

NEW BULLETINS

MACHINES AND ATTACHMENTS

1 LATHE CONVERTERS — *Master Mfg. Co., Hutchinson, Kansas.* 20-page booklet describes a portable attachment which, with interchangeable heads or spindles, can accomplish all kinds of machining operations.

2 JIG BORER—*The Fosdick Machine Tool Co., Cincinnati 23, Ohio.* 20-page booklet gives features and specifications of a jig borer with automatic positioning. One section deals with special equipment available.

3 SURFACE GRINDERS — *Mattison Machine Works, Rockford, Ill.* 10-page bulletin covers the features of vertical-spindle grinders formerly made by Hanchett. Gives specifications and shows typical applications.

4 DRILLPRESS — *South Bend Lathe Works, South Bend 22, Ind.* 4-page folder gives features and specifications on a new 14-in. model. Includes an order form.

TOOLS AND ACCESSORIES

5 CUTOFF WHEELS—*Raybestos-Manhattan, Inc., Passaic, N. J.* 6-page bulletin lists wheel-grade recommendations, cutting-performance data, and operating suggestions for Delta cut-off machines.

6 SAW BLADES—*The Motch & Merryweather Machinery Co., Cleveland 13, Ohio.* 8-page bulletin describes Triple-Chip solid and segmental saw blades. Two tables give complete data and specifications.

7 COOLANT PUMPS—*Graymills Corp., Evanston, Ill.* Catalog contains specifications, performance tables, cutaway views, and blueprints of various models. Selection charts are included.

8 DIE LUBRICATION—*Acheson Colloids Corp., Port Huron, Mich.* A technical article called "Forging Die Lu-

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27 28 29 30 31 32 33 34 35 36 37 38 39
40 41 42 43 44 45 46 47 48 49 50 51 52
53 54 55 56 57 58 59 60 61 62 63 64 65
66 67 68 69 70 71 72 73 74 75 76 77 78
79 80 81 82 83 84 85 86 87 88 89 90 91
92 93 94 95 96 97 98 99 100 101 102 103
104 105 106 107 108 109 110 111 112 113
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FYI — FOR YOUR INFORMATION

FREE details about new machines & tools
FREE data on new materials or parts
FREE shop calculators and data sheets
FREE information from advertisers
FREE advice on metalworking problems

brication" makes up this 4-page bulletin. It gives details on the uses and advantages of colloidal graphite in the lubrication of hot-forging dies.

9 CUTOFF TOOLS — *Hardinge Bros., Elmira, N. Y.* 4-page bulletin describes precision-ground tools for No. 00, 0, and 2 Brown and Sharpe automatics. Includes blueprints and complete dimensions.

10 QUENCHNG OILS—*Esso Standard Oil Co., New York 19, N. Y.* 12-page booklet on quenching and tempering oils gives properties of various mediums, and describes the processes themselves.

11 TUNGSTEN ELECTRODES—*Fansteel Metallurgical Corp., N. Chicago, Ill.* 4-page bulletin lists standard lengths and diameters supplied, and gives suggestions for improving inert-gas welding.

PLANT-SERVICE EQUIPMENT

12 CRANES—*The American Monorail Co., Cleveland 7, Ohio.* 56-page manual deals with the various cranes used in a monorail system of overhead materials handling.

13 BLAST CLEANING — *American Wheelabrator and Equipment Corp., Mishawaka, Ind.* 8-page booklet explains the advantages offered by continuous airless abrasive blast cleaning and cites production figures.

14 HAND TRUCKS — *Lewis-Shepard Prod. Inc., Watertown, Mass.* 16-page bulletin illustrates and describes a standard line of 2- and 4-wheel trucks. Includes many special types.

15 SAFETY EQUIPMENT — *Buco Products, Detroit 7, Mich.* 11-page catalog deals with such products as face protectors, hand guards, leather aprons, and sleeve guards. All of the items are described and illustrated.

PARTS AND MATERIALS

16 SPRINGS—*Accurate Spring Mfg. Co., Chicago, Ill.* 40-page booklet "Accurate Handbook of Technical Data on Springs" offers helpful shortcuts for making spring calculations, as well as data on specifying the proper spring.

17 VIBRATORS—*Syntron Co., Homer City, Pa.* 44-page catalog 506 on vibrators, feeders, electric hammers, drills, sanders, etc. Gives brief description and specifications on each product.

18 PAINT FINISHES—*E. I. DuPont De Nemours & Co., Wilmington 98, Del.* 20-page brochure depicting the history of Duco lacquers, especially as applied to the auto industry.

19 STRIP STEEL—*Acme Steel Co., Chicago 8, Ill.* First issue of Confab, a quarterly magazine produced by the company. Includes hints on proper stitching and strapping practices.

20 AIR COMPRESSORS—*The Wayne Pump Co., Fort Wayne 4, Ind.* 20-page catalog describes a line of compressors and accessories. Includes selection charts and specifications.

21 LIFTING MAGNETS—*Dings Magnetic Separator Co., Milwaukee 46, Wis.* 6-page catalog describes and illustrates a new lightweight all-welded lifting magnet.

22 HARDENING OF STAINLESS—*C. U. Scott & Son, Inc., Rock Island, Ill.* 16-page booklet deals with the preparation of stainless steel for hardening with the Scottsonizing process. This process is said to give a very hard case, prevent galling and to remain file hard at 1000 F.

23 INDUCTION MOTORS — *Allis-Chalmers, Milwaukee, Wis.* 6-page folder gives the construction features of large two-pole squirrel-cage induction motors.

24 DIE CASTINGS — *Doehler-Jarvis Corp., 386 Fourth Ave., New York 16, N. Y.* 4-page bulletin shows how the company's die castings help to produce automatic transmissions for automobiles.

25 HYDRAULIC UNITS—*Don Blackwood Inc., Hydra-Vis Div., Lafayette, Calif.* 8-page catalog on Hydra-Vis pumps, cylinders, and swivel joints.

26 PRESS DIES — *Allied Products Corp., Richard Brothers Div., Detroit 23, Mich.* 4-page bulletin describes Allite dies for producing short-run or experimental parts. The dies are cast from any formula of zinc alloy.

27 FASTENERS—*South Chester Corp., Philadelphia 2, Pa.* 6-page brochure describes a line of special fasteners for metal-to-metal and metal-to-wood applications. Includes blind rivets, anchor nuts, and screw fasteners.

MISCELLANEOUS

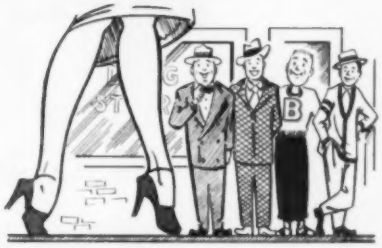
28 DRAWING REPRODUCTION — *Eastman Kodak Co., Rochester 4, N. Y.* 16-page booklet describes photographic materials and methods for improving legibility of reproduced drawings and business documents.

29 PLATING — *Joseph B. Kushner Electroplating School, Stroudsburg, Pa.* 10-page pamphlet called "The Real Secret Of Better Plating" is concerned with the relationship of the personnel used to the quality of the end product.

30 FILING SYSTEM — *Remington Rand Inc., New York 10, N. Y.* 6-page folder tells the advantages of a Triple-Check automatic filing system for files of 10 drawers or more.

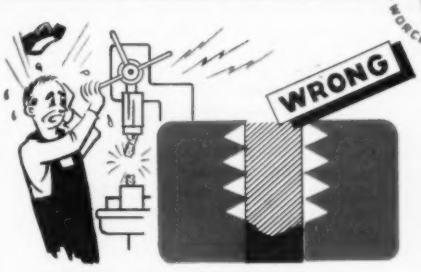
TAPPING TECHNIQUES No. 11

The way some gals stretch their hose is most shocking.
One tap — the threads weaken and ruin the stocking.

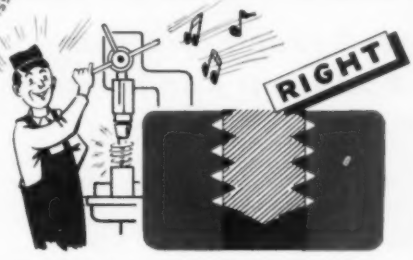


But just the right load cuts the strain to a trifle —
The threads'll be strong and we'll ALL get an eye-full!

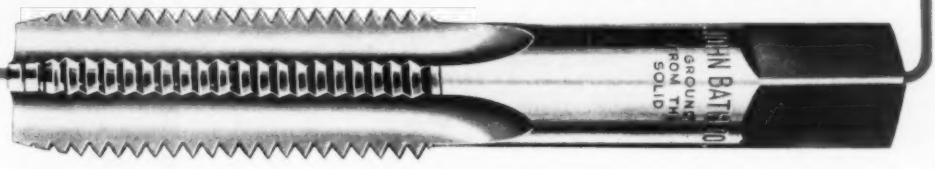
JOHN BATH CO. INC. · WORCESTER · MASS ·



Like tapping one hundred per cent full thread —
Much strain — no gain — the tap breaks instead!



If you'll tap to a normal seventy-five,
Your threads'll be strong . . . your tap'll survive!



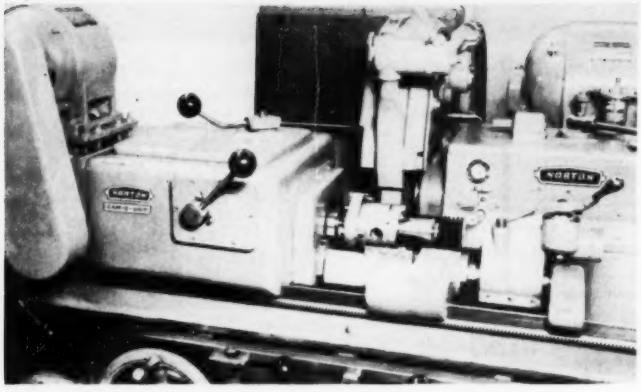
INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

When holes are drilled smaller than practical, taps work with great difficulty and there is danger of loading or breakage. Under such a condition the tap cuts on the root and is said to be cutting 100% of thread. While there are cases where 100% depth of thread is necessary, generally around 75% is practical, economical and allows an ample safety margin.

Bath Taps are "ground from the solid" and are made in many styles for threading many different metals. Available in standard stock sizes or custom built for special jobs. Let a BATH representative help with your threading problems . . . or write us!

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED
22 Grafton St., Worcester, Mass.



Taper Ground on Piston By Rocking It About Footstock

A unit for grinding automotive or other types of pistons where a taper to the conventional relief form is required.

It grinds the desired shape by holding the piston between centers, with the head end of the piston being carried in a dog or holder, and centered on the master-cam spindle center. The bottom end of the piston is supported on a special footstock center, carrying a spherical ball bearing. The footstock in which this center seats is not mounted on the rocking bar, as in normal cam or shape-grinding practice. Rather, it is mounted on a stationary member of the machine.

The spherical ball bearing becomes a pivot about which the piston revolves and oscillates according to the motion of the rocking bar as imparted by the master cam. In-and-out motion at the footstock pivot is zero.

Therefore, the motion and corresponding amount of piston relief that is ground at any point between these centers are proportional to the distance from the footstock pivot. Thus a greater amount of relief is ground at the head of the piston than at the bottom of the skirt, which is nearer the pivot.

Norton Co., Worcester, Mass.
(MORE DATA? CIRCLE FYI 65, p. 147)

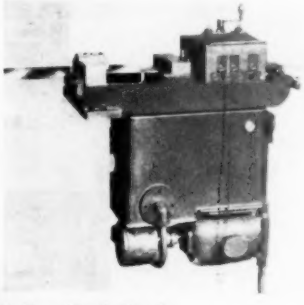
ROTARY STRAIGHTENER is positioned on the production line between final sizing and last cutoff. Copper, stainless steel, and Inconel tubing flow from the run-out table into the cutoff machines. It is said neither to increase nor decrease OD and ID.—*Greenville Tubes Inc., Greenville, Pa.* (MORE DATA? CIRCLE FYI 66, p. 147)

Heavy Duty Speed Reducers Have Worm Integral With Shaft

The T-Series line of horizontal, right-angle-drive Reductors, are equipped with heavy gears, worm integral with shaft, and rugged steel shafts.

An improved numbering system makes it easy to select the correct Reductor for any requirement. There are eight types, each in a range of speed ratios and horsepowers, or load-carrying capacities. Gear ratios run from 1 to 1 up to 4000 to 1. Output speeds, based on full-load motor speeds, run from 0.45 to 588.23 rpm.

Boston Gear Works, Quincy 71, Mass.
(MORE DATA? CIRCLE FYI 67, p. 147)



Haller Stock Feed Handles Work Up to 8-In. Wide

This gripper feed for use on almost any punch press, is known as the Model 8 FTS. Hydraulically operated, it has a capacity to handle stock up to 8-in. wide and to feed any desired length up to 24 in. Accuracy of feed is to within 0.003 in. to 0.005 in. on each stroke.

Installation and adjustments can be made quickly so that the stock feed can be moved readily to other presses when desired. It is actuated from the press ram and has sufficient power to pull the stock through a roll-type straightener which is an integral part of the unit. It is mounted on the bolster plate and can be located to feed from the left, right front or back.

Special Engineering Service, Inc., 8161 Livernois Ave., Detroit 4, Mich.
(MORE DATA? CIRCLE FYI 68, p. 147)

Here's how to

SAVE TIME on Milling Operations

END MILLS

	Number of passes necessary to mill slot	Time per slot	Number of complete slots before changing mills
End Mills previously used	24 to 32	9 min.	4-1/2
Cleveland End Mills	10	1-1/6 min.	27

The above figures, taken from an actual test on a roughing operation in a customer's plant, proved that *Cleveland* End Mills save time and money in cutting slots in a cast steel mold. There may be an opportunity for similar economies in *your* milling operations. Let a *Cleveland* Service Representative make a survey, without cost or obligation. Contact our nearest Stockroom, or . . .

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THE CLEVELAND TWIST DRILL CO.

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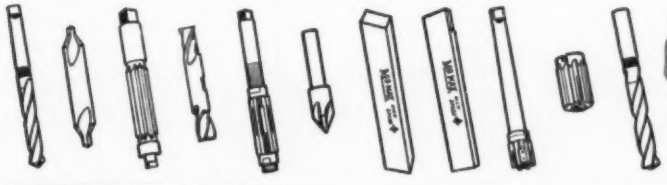
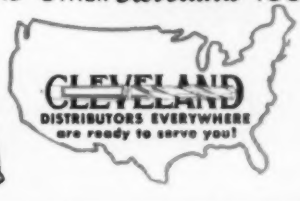
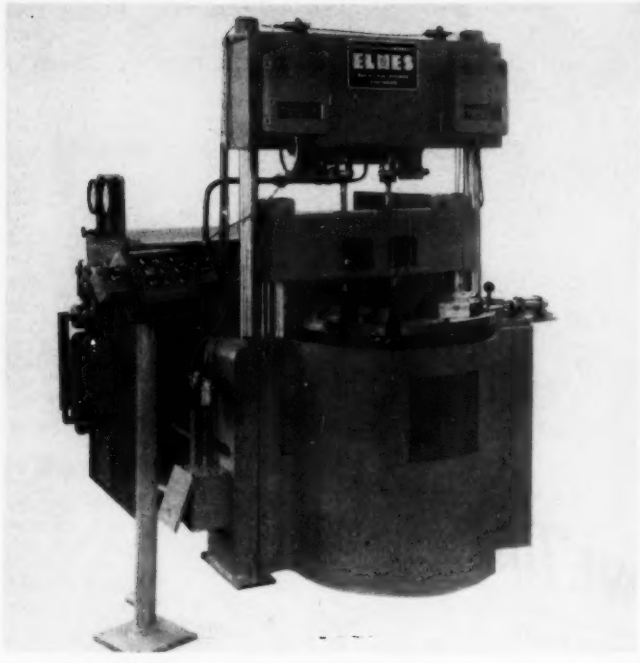
E. P. Barrus, Ltd., London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS







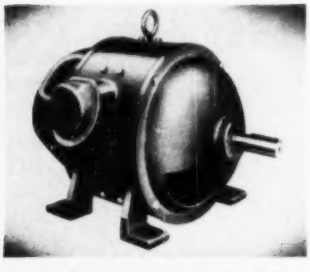
Transfer Press Molds Rubber

A hydraulic transfer press, designed for the molding of small rubber parts around metal inserts, produces at the rate of 20 units per two-minute cycle. This is said to be a substantial increase over previously used methods.

The press is equipped with two transfer rams, each of 20-ton capacity. Moving-down die clamp has 60-ton capacity. Lower halves of the die are mounted on a rotating 3-station table providing nearly continuous processing of material, permitting curing and unloading while material is being molded. Equipped with semiautomatic time-cycle controls, pushbutton operated, with inching features for all movements.

Elmes Engineering Div., American Steel Foundries, 1150 Tennessee Ave., Cincinnati 29, Ohio

(MORE DATA? CIRCLE FYI 69, p. 147)



Westinghouse DC Motor Features Accessibility and Protection

Design features used in the ac Life-Line motor have been applied to the SK dc motor, used for many applications in the materials-handling industry.

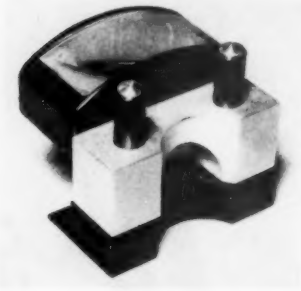
One feature is its accessibility and protection. The rear bracket is solid on top, and covers can be added to the front bracket and lower opening of the rear bracket to provide any degree of protection desired, from drip-proof to drip-proof-protected and totally enclosed. To facilitate removal, the covers use strong, stainless-steel springs to snap it in place, similar to an automobile hub cap. To remove, a large lug is provided; a screwdriver can be inserted under the lip to snap it off.

Pre-lubricated ball bearings are used. Each bearing has been packed with a proper amount of the correct grade of grease, to last for the life of the bearing. No additional lubrication is required.

An improvement has been made in brush rod insulation. A molded Melamine rocker ring is used to hold and insulate the rods supporting the holders. Melamine, a new insulating material with high dielectric strength, is said not to carbonize when current flows across its surface.

Westinghouse Electric Corp., 306 Fourth Ave., Pittsburgh 30, Pa.

(MORE DATA? CIRCLE FYI 70, p. 147)



Reading of Height-Gage Scales Made Easy by Magnifying Glass

Some of the improvements made in the Magna Eye for height gages and vernier calipers are:

1. Redesigned and improved lenses. Wider field is covered; lines are true and correct, no distortion. Larger window admits more light to scale of tools. Greater accuracy of readings is claimed.
2. Focusing points are shorter.
3. Posts have been redesigned to tightly screw into the base, assuring greater rigidity.
4. Weight has been reduced through extensive use of aluminum.
5. Focusing unit is held in place when focused, through a friction adjustment that holds proper focus without tightening screws or making any other adjustments.

Stebar Co., 711 W. Lake St., Minneapolis 8, Minn.

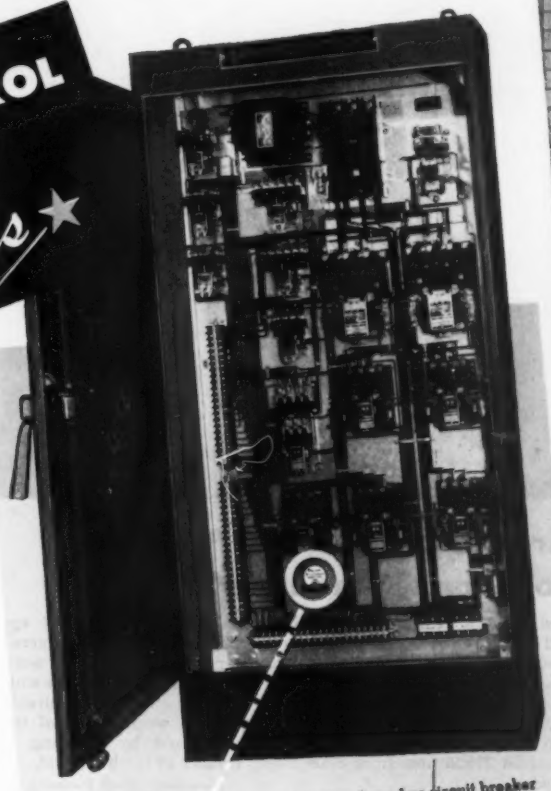
(MORE DATA? CIRCLE FYI 71, p. 147)

Steel tape is made of two plated-steel sections covered by durable artificial leather. The hook at the end of the tape folds out of the way when not in use. The winding handle also folds into the case and is instantly released for use by a pushbutton. Available in 25-, 50-, 75-, and 100-ft. lengths.

L. S. Starrett Co., Athol, Mass.

(MORE DATA? CIRLE FYI 72, p. 147)

ELECTRICAL CONTROL BUILT TO *Specifications* ★



Plus **DESIGN LEADERSHIP** *in circuits, components, accessories and enclosure fabrication . . .*

Plus **FIELD ENGINEERING SERVICE** *through experienced, practical engineers stationed in principal cities.*

Electrical standards for machine tools are published by the NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION for general industry use and by the JOINT INDUSTRY CONFERENCE for the mass production industries. By specifying control built to these standards, users benefit from the combined experience and judgment of engineers in a wide variety of industrial plants. The construction features required assure maximum safety, uninterrupted production and long service.

Whether a simple combination starter or a complex panel, Square D will build control to meet either NMTBA or JIC standards.

Your Square D Field Engineer will be glad to work with you on any electrical control problem.

Engineered, Factory-Assembled and Tested by SQUARE D COMPANY · MILWAUKEE WIS

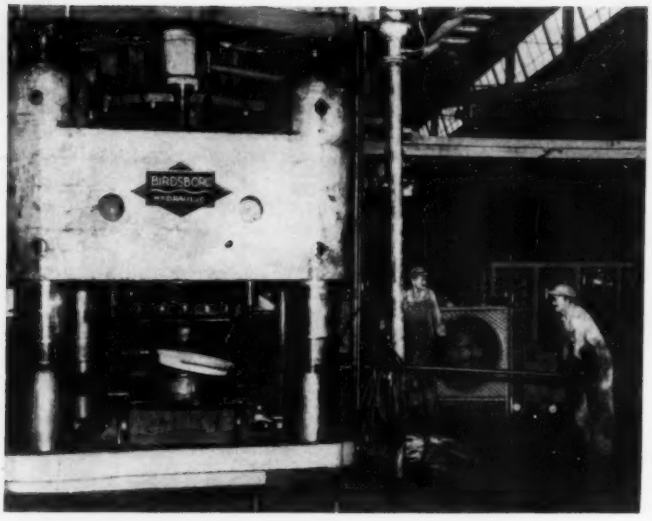
Controller above has circuit breaker disconnect interlocked with door, and 110 volt control from dual primary transformer having extra capacity for 100 watt work lamp. Safety features include control fuse, terminal for grounding and control circuit designed with all coils wired to grounded line.

Watch for Square D's Display Coach—Now on Tour!

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO · SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.



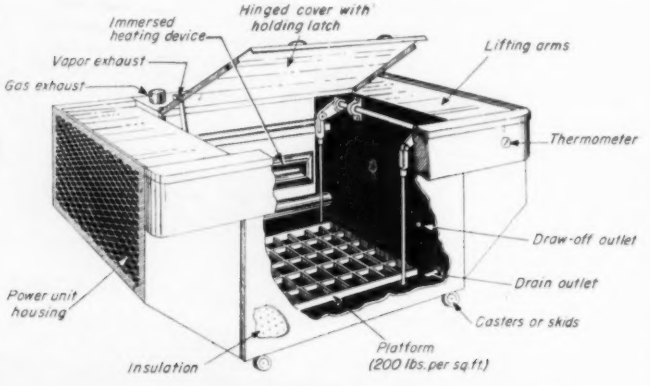
Birdsboro Hydraulic Press Cold Forms Variety of Parts

Designed originally for cold rubber-pad forming of sheet-metal parts used in airplane-frame construction, this 5,000-ton press is now making hot forged parts for earth-moving equipment. For example, one operation is the forging of tire retainer rings for 21x25 tires from SAE 1035 Steel.

The press is single action, with both pushbutton and sensitive manual control. It is of open four-column construction, arranged for rapid advance to the work. It has a quick-reversal feature which makes its operating cycle desirable for hot forging work. Wear of the dies is minimized by avoiding prolonged contact of the hot metal.

Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.

(MORE DATA? CIRCLE FYI 73, p. 147)



Magnus Chip Remover Agitates Parts 50 Times a Min.

Called the Aja-Dip, this machine removes chips and light oils from machined parts. It is claimed that, unlike other machines for the same purpose, it is able to penetrate into the mass of parts to remove the chips. A platform moves up and down through the solution, scrubbing the parts of all dirt and particles.

The operation is completely automatic, requiring only manual loading and unloading. Available in several sizes, the machine handles between 75 and 10,000 lb per hour. If a heated solution is desired, gas, steam, fuel oil, kerosene, or electricity can be used.

Equipment Div., Magnus Chemical Co., Garwood, N.J.

(MORE DATA? CIRCLE FYI 74, p. 147)

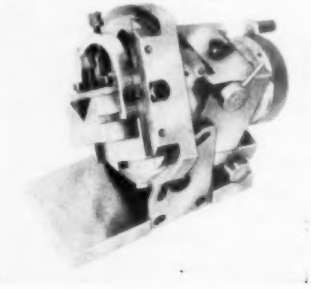
Carbide-Tipped Expansion Reamer Has Diamond-Lapped Cutting Edges

This reamer is said to permit easy and extremely accurate expansion wherever a true hole and fine finish are needed. It is available in sizes from ⅜ to 1½ in., both straight and taper shank.

Features include longer carbide tips for extra bearing surface in the hole, and diamond lap cutting edges to assure free cutting action. Rust-resistant tool shanks are said to be made from high-quality heat-treated materials.

Wendt-Sonis Co., Hannibal, Missouri

(MORE DATA? CIRCLE FYI 75, p. 147)



Attachment Grinds Eccentrics With One Setup

The Sine-A-Dex is able to do one set-up grinding of eccentrics and unlimited off-center work.

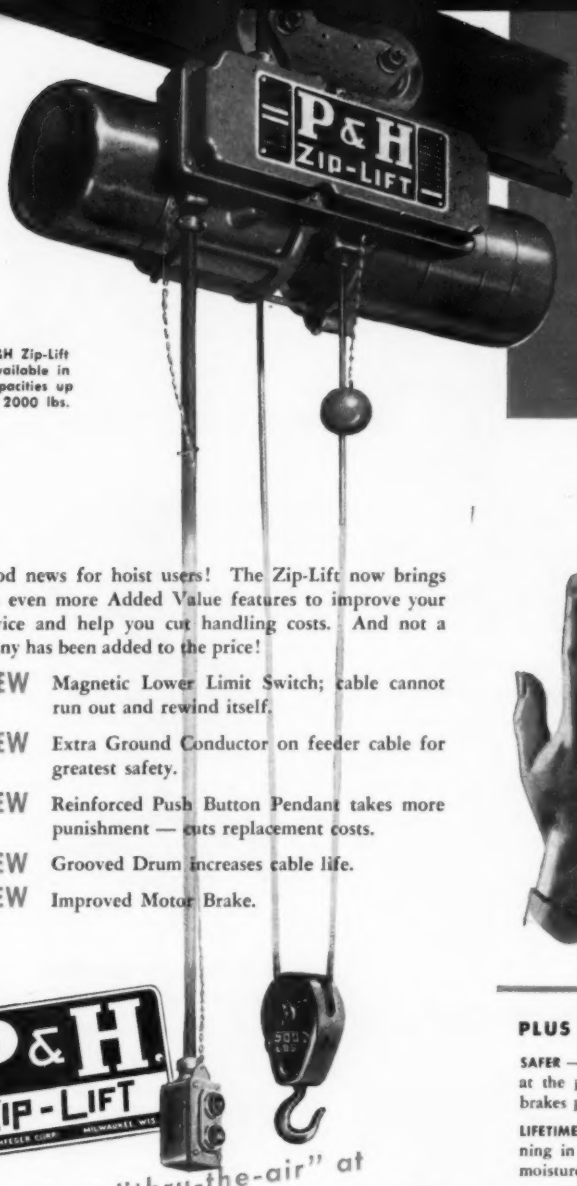
A face plate which incorporates a V-block can be set off center in both directions, permiting the grinding of such items as rectangular punches requiring a radius on each corner. Two setting rings with verniers provide the fixture with a rapid means of setting included angles to any number of degrees on either side of any reference line.

Star Gauge Co., 261 Oak Grove Ave., Springfield, Mass.

(MORE DATA? CIRCLE FYI 76, p. 147)

Now-more value than ever...

WITH 5 NEW FEATURES TO HELP CUT YOUR COSTS



P&H Zip-Lift Available in Capacities up to 2000 lbs.

Good news for hoist users! The Zip-Lift now brings you even more Added Value features to improve your service and help you cut handling costs. And not a penny has been added to the price!

- **NEW** Magnetic Lower Limit Switch; cable cannot run out and rewind itself.
- **NEW** Extra Ground Conductor on feeder cable for greatest safety.
- **NEW** Reinforced Push Button Pendant takes more punishment — cuts replacement costs.
- **NEW** Grooved Drum increases cable life.
- **NEW** Improved Motor Brake.

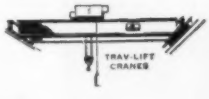
P&H ZIP-LIFT HARNISCHFEGER CORP. MILWAUKEE, WIS.

handle it "thru-the-air" at lower cost

See how dozens of handling problems have been solved by the Zip-Lift. This picture-filled book of ideas tells the story. Write for your copy of Bulletin H-20.

NEVI-LIFT HOISTS

ZIP-LIFT HOISTS



TRAV-LIFT CRANES

HEAVY DUTY CRANE

PLUS THESE ADDED VALUES:

SAFER — Full magnetic control with current reduced to 110 volts at the push-button. Crane type limit switch and large double brakes provide maximum safety. No open wiring.

LIFETIME CONSTRUCTION — Precision built — shaved gears running in oil—grease-sealed antifriction bearings—fully enclosed, moisture-proof, dust-proof, acid-proof.

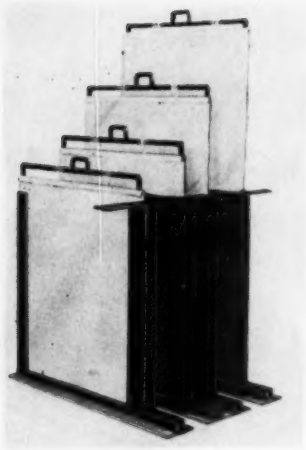
SMOOTHER OPERATION — Motor specifically built for hoist service — to withstand frequent reversal. Loads controlled within a fraction of an inch.

ALERT SERVICE — Immediate stock delivery from qualified dealers everywhere — backed by 18 branch offices and 8 warehouses.

The Zip-Lift is America's biggest selling wire rope hoist.

P&H ELECTRIC HOISTS
4514 West National Avenue
Milwaukee 14, Wisconsin
HARNISCHFEGER CORPORATION

EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • CRAWLER AND TRUCK CRANES • DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES



Standard Tanks Converted For Diaphragm Plating

Diaphragm plating provides for the segregation of anode and cathode compartments by means of canvas-duck screens. The object is to produce smoother plated surfaces, allow higher current densities, and eliminate polarization. The anode solution is pumped off, filtered, and passed to the cathode compartment free of insoluble metallics and organics which form at the anode and ordinarily deposit on the work pieces.

The conversion unit consists of fabric sleeves that slide on rubber-insulated metal frames which in turn slide into insulated channels with the cathode side protected by insulated, woven-wire guards. The sections can be constructed for tanks of any width, length, or depth with single or multiple work lanes.

Automotive Rubber Co., Inc., 8601 Epworth Blvd., Detroit 4, Mich.

(MORE DATA? CIRCLE FYI 77, p. 147)

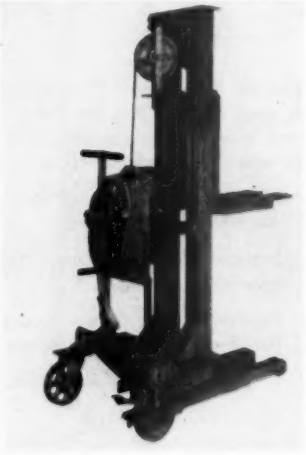
Baker Fork Trucks Have Increased Operator Convenience

The operator of this fork truck sits on a comfortable, padded seat and backrest. He may enter the driving position from either side since there are no obstructions in the operator's compartment. The steering wheel is of the tilted automotive type with one button in the center of the wheel. Directional, hoist and tilt control levers are convenient to the operator's right hand directly in front of him. A foot-size accelerator pedal is adjacent to the brake pedal as in an automobile.

Pivot, tilt and hose connections are designed so that the uprights can be removed in twenty minutes. The standard telescoping lift is 126 inches, with 83 inches being the overall height. The lift and tilt mechanism is hydraulically operated and employs a low-pressure hydraulic system. The cutaway design of the dash panel gives an unobstructed view of the end of the forks.

The Baker-Raulang Co., Cleveland, Ohio

(MORE DATA? CIRCLE FYI 79, p. 147)



Manual or Electrical Operation Available for Pallet Elevators

This portable elevator is designed for double and triple-decking single-faced pallet loads.

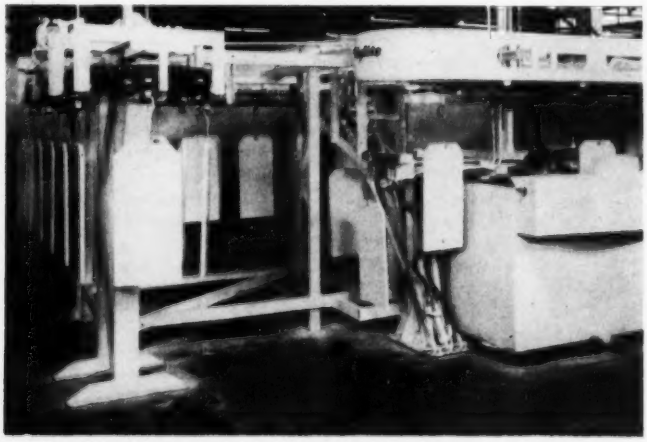
The operator guides the fork (lowered height 3½ in.) under the pallet and cranks the load up to the desired height. He then runs the elevator up to the load resting on the floor. Opening the brakes lowers the load gently onto the pile below it.

The unit pictured is for double-decking only and has no hinge. Its overall height is 6 ft. 6 in. and its lifting height is 4 ft. 2 in. For triple-decking, this elevator is built with any lifting height required, and has a hinge which permits the unit, when collapsed, to pass under overhead obstructions.

Hand or electric operation is available. For capacities of 2000, 3000, 4000, and 5000 lb.

Barrett-Cravens Co., 4609 S. Western Blvd., Chicago 9, Ill.

(MORE DATA? CIRCLE FYI 80, p. 147)



PLATING becomes fully automatic when using this conveyor loader. It eliminates the manual loading and unloading of racks at the machine. It can carry racks to a station located in an area free from fumes, noise and dirt.—*The Udylite Corp., 1653 Grand Blvd., Detroit, Mich.*

(MORE DATA? CIRCLE FYI 78, p. 147)

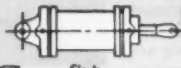
RIVETT Furnishes—

a Complete Power Package

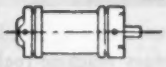
Rivett can furnish the correct valve and cylinder for any hydraulic circuit. There are nearly 300 primary models in the standard Rivett line, each available in a variety of sizes and types. Because of the simplicity of Rivett design, variations can be made to meet any unique situation.

Seven Standard Mountings

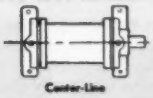
Model 211 Foot Mounted Double-Acting Non-Rotating Cylinder.



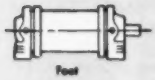
Clevis



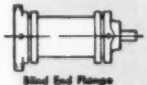
Rabbet



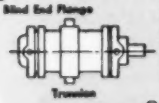
Center-Line



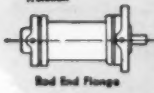
Foot



Blind End Flange



Trunnion



Rod End Flange

CYLINDERS

Offered in pressure ranges of 300 P.S.I. maximum, and 1500 P.S.I. maximum oil services. 3000 P.S.I. maximum service and higher pressure ranges furnished on application. Available in ten bore diameters, in strokes up to 96", with standard and 2:1 differential over-size rod; and with cushioning rod end, blind end or both. Special models supplied.

Send for Rivett Catalog Sections 104 and 202

Model 8832 Sequence Valve

Model 8430 Cam Operated Flow Control Valve

Model 7200-1 Oil Pilot Operated Valve

Model 3605 Solenoid Pilot Operated Four-Way Valve

VALVES

Designed for oil service pressures up to 1500 P.S.I., and furnished for 3000 P.S.I. in certain models. Available in standard, spring-return, spring-centered, and ball detent action; five piston designs: hand, foot, cam, solenoid, oil pressure, and air pressure operated; 1/4", 3/8", 1/2", 3/4", 1", 1-1/4" and 1-1/2" sizes.

Model 3805 Oil Pressure Operated Four-Way Valve

POWER UNITS

Series 9100 single pump, in 5 tank sizes. Capacities, .4 G.P.M. to 40 G.P.M. at 1000 P.S.I. Series 9200 double pumps in 5 tank sizes. Delivery combinations, 3 G.P.M. and .4 G.P.M. to 40 G.P.M. and 12 G.P.M. at 1000 P.S.I.

Model 3900 Air Pressure Operated Four-Way Valve

Model 5310 Cam Operated Four-Way Valve

Model 5100 Hand Operated Four-Way Valve

Model 5500 Double Solenoid Operated Four-Way Valve

RIVETT DEALERS EXPERIENCED IN HYDRAULIC APPLICATION

Newark & New York—Compressed Air Products, 1977 Springfield Ave., Maplewood, N. J., 400 Third Ave., Brooklyn, N. Y.
Philadelphia, Pa.—The Battersby Co., 3701 N. Broad St.
Boston, Mass.—L. W. Sheehy, 1104 Park Sq. Bldg.
Baltimore, Md.—Cauliflower Equip. Co., 516 No. Loudon
Pittsburgh, Pa.—F. R. Magill Co., 44 McKnight St.
Cleveland, Ohio—Garco Machy. Co., 7702 Carnegie
Detroit, Mich.—Fors Sales Co., 2832 E. Grand Blvd.
Flint, Mich.—Shively Sales Company, 719 E. 2nd Ave.
Chicago and Milwaukee—MacMillin Engineering Corp., 6806 North Clark St., Chicago 26, Ill.
St. Louis, Mo.—William Scheer Co., 6376 Clayton Rd.
Dayton, Ohio—Seifreat-Elstad Machy., P.O. Box 322
Cincinnati, Ohio—Seifreat-Elstad Machy., P.O. Box 344
Columbus, Ohio—Seifreat-Elstad Machy., P.O. Box 922
Columbus, Ga.—Bunn H. Martin, P. O. Box 350
Minneapolis, Minn.—Anderson Machine Tool Co., 2641 University Ave., St. Paul 4, Minnesota
Denver, Col.—Iver J. Esbenson Co., 1249 Calif. St.
Los Angeles, Calif.—Haskel Engineering & Supply Co., 721 West Broadway, Glendale, California
San Francisco, Calif.—Ditzen Engineering and Sales, 600 16th St., Oakland 12, Calif.
Portland, Oregon—Hydraulic Power Equipment Co., 2316 N. W. Savier St.
Seattle, Wash.—Pump Engineering Co., 1331 3rd Ave. Bldg.
Canada—Duncan Machinery Co., Ltd., 1922 Wyandotte St. East, Windsor, Ontario; 371 Bay St., Toronto

Dept. AMI, RIVETT LATHE & GRINDER, Inc., Brighton 35, Boston, Massachusetts

WHEN YOU APPLY HYDRAULIC OR AIR POWER *Plan with*

RIVETT

Air and Hydraulic Valves and Cylinders, Hydraulic Power Units.

Testing Machine Uses Fluid-Pressure Weighing System

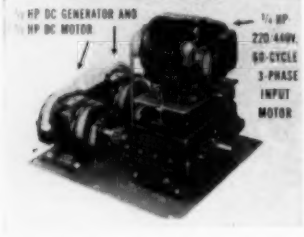
The most important feature of this machine is in the weighing system. It utilizes hydraulic and pneumatic principles which are said to give sensitivity, accuracy, and usefulness to the standard line of Baldwin-Tate-Emery testing machines. In these weighing mechanisms, fluid pressure is always proportional to load.

For load indication any changes in this fluid pressure are immediately transferred to an indicator which utilizes the null-balance principle operated by an air servo-motor.

Of 5,000 lb. capacity, it has four ranges of 5,000, 1,000, 200 and 50 lb. When an air cell is used in conjunction with a hydraulic cell, two additional load ranges become available —10 lb. and 2 lb.

The Baldwin Locomotive Works, Testing Equipment Dept., Philadelphia 42, Pa.

(MORE DATA? CIRCLE FYI 81, p. 147)



Variable-Speed Drive Delivers Max. Torque at Zero Speed

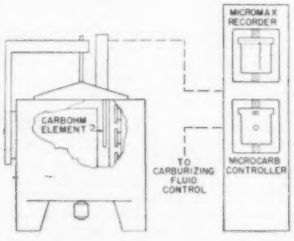
This drive is rated at ½ hp in non-reversing and 1/3 hp in reversing models. Known as the Specon No. 00ED, it makes use of standard ac squirrel-caged motor, two standard dc motors, and a differential gear box. The ac motor is coupled with the two dc motors through the differential gearbox. The dc motors are connected in a closed loop and require no outside source of power.

The maximum output speed of the non-reversing model can be supplied from 250 to 1000 rpm for direct coupling. Minimum output speed in all cases is zero, although motors are not stopped but continue to run. Maximum torque is obtained at zero speed with gradual decrease as the output speed increases, until at the rated speed the torque assumes the rated value.

The reversing model can be supplied with output speeds of from ±150 to ±600 rpm for direct coupling. The speed reversal is claimed to occur with absolute smoothness, due to the fact that all reversing action occurs only in the differential.

Speed Control Corp., 1450 E. 289th St., Dept. C-14, Wickliffe, Ohio

(MORE DATA? CIRCLE FYI 82, p. 147)



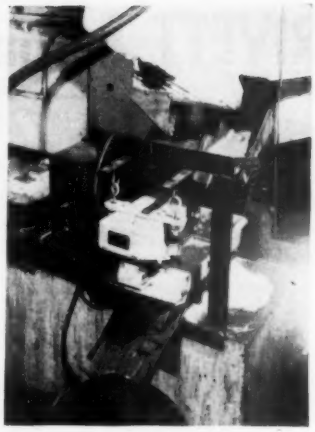
Automatic Carbon-Content Control For Carburizing Furnaces

This development is said to make it possible for heat-treaters to do something they have never been able to do before with a heat-treating furnace—that is, measure and control the carbon potential of furnace atmosphere directly in terms of % carbon. By means of this Microcarb control, they can regulate the surface carbon content of steel during heat-treating as accurately as they regulate temperature.

Principal feature of the system is a detecting element, which projects into the furnace work chamber like a thermocouple, and electrically senses the carburizing potential of the atmosphere. Connected to this element is a controller, which carbumatically adjusts the flow of carburizing fluid to hold carbon potential of furnace gas at any selected value between 0.15 and 1.15%. A recorder draws a continuous record of % carbon as detected by the element.

Leeds & Northrop Co., 4934 Stenton Ave., Philadelphia 44, Pa.

(MORE DATA? CIRCLE FYI 83, p. 147)



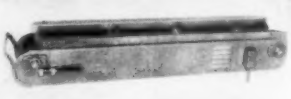
Syntron Screening Feeder Desludges Machine-Tool Coolant

Used coolant from a machine tool is run through a vibrating screen which catches the steel filings and abrasive grains and feeds them as a sludge into a receptacle. The desludged liquid goes back to the storage tank.

In one application, it was estimated that the feeder was removing approximately 90% of the sludge. The feeder is installed on the edge of the coolant tank as pictured.

Syntron Co., Homer City, Pa.

(MORE DATA? CIRCLE FYI 84, p. 147)



Small Industrial Conveyor Has Neoprene-Impregnated Belt

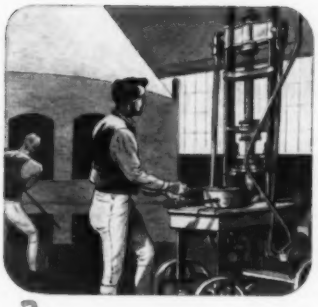
This conveyor, identified as 100-U, is only 5 ft. in length. It is equipped with an 8-in. neoprene-impregnated belt with flights 1⅜ in. in height spaced on 18-in. centers. Belt speed is approximately 125 fpm. Take-up mechanism provides for belt adjustment. Pulleys are equipped with permanently lubricated and sealed ball bearings.

The unit is powered by 1/12-hp motor mounted inside the conveyor channel. Removable louvered panel provides an access to the motor for maintenance. A thermal switch is located on the side of the channel to which is attached 15 ft. of 14-2 rubber-covered wire.

Industrial Engineering & Mfg. Co., Brimfield, Ind.

(MORE DATA? CIRCLE FYI 85, p. 147)

1 **1621**—Glass was money! America's first glass factory was actually a mint—not for the manufacture of coins but to make glass beads for *use* as money when buying land, food and furs from the Indians.



2 **1827**—Blown glass was the rule until Enoch Robinson, a carpenter, figured glass could be *pressed* into shape . . . the glass pressing machine was born. Electricity to power new machines was still to come.

3 **1899**—Owens invented a machine to make bottles as the machine age arrived in glass. By 1915, Howell "Red Band" Motors were making important contributions to this and other industries.

ANOTHER HOWELL SUCCESS STORY

GLASS...from artisans to automatic machines

4 **Today**—Modern, electrically driven machines have improved quality, cut costs and increased output in the glass making industry. For example, this unique glass beveling machine, equipped with 7 dynamically balanced Howell Motors, *automatically* bevels glass at the rate of 2,000 inches per hour!

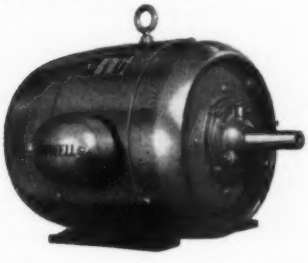
You'll also find precision-built Howell Industrial Type Motors powering bottle and bulb machines, conveyors, grinders, polishers, plate and window machines in the glass industry.

Elsewhere, Howell's wide range of standard NEMA motors, and special motors designed to customer requirements, serve dependably and efficiently under the toughest conditions.

For a really profitable investment, buy HOWELL!

Free enterprise encourages mass production, supplies more jobs—provides more goods for more people at less cost.

Howell totally enclosed, fan-cooled motor—windings completely sealed against dirt and weather.

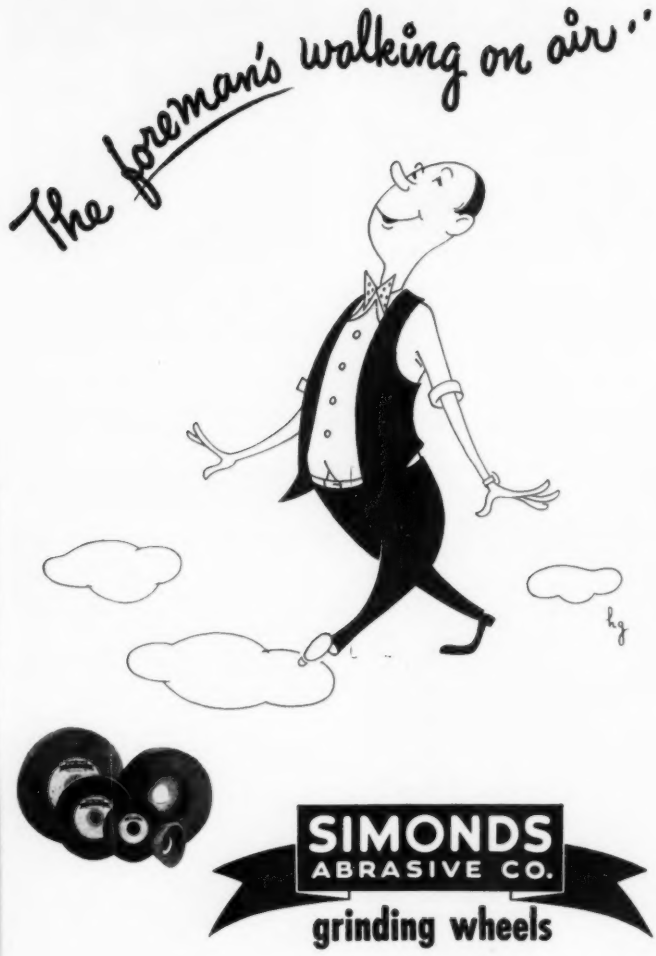


HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Precision-built Industrial Motors Since 1915

HOWELL Red Band MOTORS



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Production up . . . costs down . . . and rejects rare as a February heatwave. No wonder the grinding foreman is uplifted. And here's the reason. He's using grinding wheels exactly suited to his jobs. They're Simonds Abrasive Company wheels . . . part of a complete line including grinding wheels, mounted wheels and points, segments and abrasive grains . . . all accurately specified, rigidly tested and scientifically produced under complete quality control by Simonds Abrasive Company, a major manufacturer of grinding wheels for over 50 years. Write for free data book.

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Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

ROUND TABLE Discussion

TELEVISION EYES

A MAN'S private business may be his own concern, but his employer has a right to inquire or interfere when the private business affects the efficiency of the worker and the interests of the employer.

The employer, however, is not justified in arbitrarily discharging the errant worker without having first investigated the cause of the inefficiency and given sufficient warning against repetition of the action.

There can be no question that an employee's private business becomes a concern of the employer when it leads to let-down in his work. Where the private business has to do with too much television viewing the night before and leads to a condition of undue fatigue of the worker on the following morning, a warning is necessary in order to remedy the situation. Bleary eyes are hardly conducive to efficient work, especially where micrometer reading is involved. However, before discharge action is taken, the employee should be interviewed by the foreman as to the exact cause of his difficulty, and remedial action can be started to prevent repetition of the trouble.

Discharge, being the most drastic of all disciplinary measures, is, at the same time, one of the least satisfactory. In this case, it may mean the loss of a heretofore efficient employee and the deprivation of the services of an experienced man whose training and experience have been gained, to some extent, at company expense. It necessitates the breaking-in of a new worker, usually an expensive process.

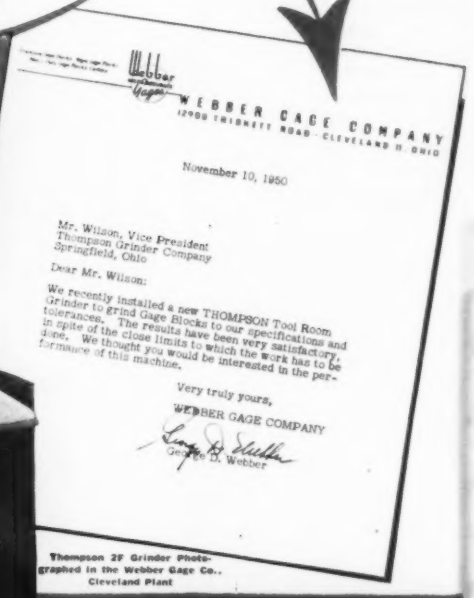
"Television eyes" presents a serious problem to the shop foreman. If some form of disciplinary action is not taken to avoid their effect on the efficiency of the men, the consequences may well be disruptive to the productive capacity of the shop. Before this offense becomes a habit, steps should be taken to break it. When what the man does on his own time has a deleterious effect on what he does in the plant, it becomes the foreman's business also. If it means that the worker does not deliver a full day's work, it is time for the foreman to interfere.

This action by the foreman should have a positive rather than a negative effect, that is, it should encourage the affected worker to cooperate

Here's Proof

The New Thompson Type 2F is a SUPER PRECISION Tool Room Grinder

Thompson 2F Grinder Photographed in the Webber Gage Co., Cleveland Plant



WEBBER GAGE COMPANY
12900 TRISKETT ROAD · CLEVELAND 11, OHIO

November 10, 1950

Mr. Wilson, Vice President
Thompson Grinder Company
Springfield, Ohio

Dear Mr. Wilson:

We recently installed a new THOMPSON Tool Room Grinder to grind Gage Blocks to our specifications and tolerances. The results have been very satisfactory, in spite of the close limits to which the work has to be done. We thought you would be interested in the performance of this machine.

Very truly yours,
WEBBER GAGE COMPANY
G. D. Webber

COMPARE THIS NEW 8 x 10 x 24 TOOL ROOM GRINDER

When working to a tolerance of four millionths of an inch such as is observed when making Webber Gage Blocks, the rough or preliminary grinding plays an important role in keeping cost of the final finishing within reasonable limits.

Compare These Features:

- HARDENED AND GROUND cross slide ways completely sealed.
- One shot lubrication to cross slide ways and internal saddle bearings.
- HARDENED AND GROUND sealed anti-friction vertical slide.
- HARDENED AND GROUND BED WAYS with automatic lubrication.
- 3600/1800 R.P.M. 2 speed wheel head. Heavy alloy steel spindle heat treated, runs in super precision ball bearings accurately preloaded, lifetime lubricated.

Handy control panel.

- Elevation micrometer stop graduated in .0001".
- GROUND THREAD FEED SCREW.
- Automatic wheel TRUING device.
- Longitudinal hand wheel with automatic engagement.
- Hydraulic head movement throttle with rapid traverse.
- Hydraulic table movement throttle.
- Elevating hand wheel graduated in .0005".
- GROUND THREAD FEED SCREW.

WRITE TODAY for complete specifications and performance data. Address Dept. 10, Thompson Grinder Co., Springfield, Ohio.

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The only manufacturer of a complete range of heavy duty and light duty surface and contour grinders for industry.

Thompson SURFACE Grinders

The Thompson Grinder Company, Springfield, Ohio

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UNBRAKO
We can deliver...
A continuing, long-range program of plant modernization and improvement is one of the ways we keep our capacity equal to the increasing demand for UNBRAKO Socket Screw Products.
It takes skilled people, working with top-flight equipment in spacious, well-planned buildings to give you all the UNBRAKOs you want, when you want them.
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Knurled Socket Head Cap Screw
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Knurled Point Socket Set Screw
Knurled Socket Head Shoulder Screw
Fully-Formed Pressure Plug
Precision-Ground Dowel Pin

rather than to resent the action. He should recognize the reasonableness and propriety of the foreman's warning.

Where this warning is handled on a personal basis through an interview in the foreman's office, it will usually result in securing an agreement of the offender upon a future course of action that will increase efficiency. What is necessary is that the interview be so conducted that the offender is led to see the reason for the foreman's warning, and second, the worker's own interest in its necessity. In this way, the matter may be settled rather easily, and the worker will realize that the foreman has a legitimate reason for interfering in his personal activities outside the plant.

The worker's personal activities should be a source of interest to the supervisor and should be such as to be above reproach. The worker lives in a house of glass, as far as his foreman is concerned, and he is expected to live an exemplary life. He may feel that what he does outside the plant should be of no concern to the foreman, but such sentiment should not be carried to the point where his shop work is affected by his outside activities. It is therefore imperative that the worker heed the advice of his supervisor and guide his night-life so that there is no cause for undue fatigue on the job. The worker should plan his night's pleasure so that it is not at the expense of the company.

Harry Kaufman
Philadelphia

•

KICKBACKS

SURELY the performance of a task in the time estimated can be brought to the firm concerned with no danger. Rather, even if the estimate is too big, the more speedily such jobs are done, the better for the firm as well as the men. It is desirable of course that times estimated reflect the true time value of the jobs involved if only that these become controlling cost factors, once they are fixed. Costs must become lower however, the more quickly jobs are done, and for one or more reasons.

Once the target is set, to fear the results is simply to set up the big wages bogey and this is to court labor dissatisfaction. The real bogey is incorrect estimates, whether these be too large or small. The logic of the matter can be well illustrated by an example in which all the factors mentioned figured.

During the first World War, I was

"Save with SIMONDS" Forged

Rotary Shear Knives

So says anyone who slits any type of sheet or strip metal. For they *know* that these "Red Streak" Knives cut straighter, cleaner, *and longer between sharpenings* . . . because they're forged and micro-finish ground. Forging condenses the grain structure — prevents nicking. Micro-finish grinding permits non-ferrous metal slitting without "pick-up."

Designed for specific shearing applications, these long-lived knives are made from 3 types of steel forged in Simonds' own mills . . . High Chrome, Special Alloy and High Speed. Send for free "Shear Selector" chart or ask for a "Simonds Man" to help with your slitting problems.

. . . and Squaring Shears

Cross-section showing "Tungsweld" High Speed Steel inlaid cutting edge.

This "Tungsweld" Squaring Shear far outlasts other types . . . causes less down-time . . . gives far faster, cleaner shearing of tin plate, silicon, monel, stainless and other thin sheet metals . . . all because of Simonds' special method of welding a high-speed steel inlay to tough steel backing. Order a set today made to your exact specifications and "Save with Simonds."

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

BRANCH OFFICES IN: *Boston, Chicago, San Francisco and Portland, Ore. Canadian Factory in Montreal, Que.*

IF IT'S A
JACOBS
IT HOLDS

THE JACOBS MANUFACTURING CO., WEST HARTFORD 10, CONN.

invited to go to a shipbuilding and engineering company, whose many activities included airplane manufacture. The purpose was to obtain increased output and the extension of the Halsey premium system, which had been incompetently introduced. This introduction consisted of paying a bonus of 25% on all time booked on job cards. The offer was silly as proved by the negative results. It had been promised that the times so recorded should stand, but that, for new jobs, the basis of job rates should be estimated times. At once, output was increased. One such example, and there were many, was referred to me to confirm that the time booked represented possibility. It did, and later was improved upon.

The pieces involved, which had formerly taken 6 hr, were then being done in 22 hr, the time limit being 9 hr. When the general manager heard of the pact and that the man would be paid double wages, he said, "Oh, we must alter the operation; we cannot afford to pay such big wages. The facts were as shown below, the rate of wages and oncost being one shilling per hour:

Formerly	
Time taken + premium 6 + 1½ hr	cost 7s 6d.
Oncost 6 hrs.	cost 6s0d
Total	13s6d.
New	
Time taken + premium 2½+3¼ hr,	cost 5s9d.
Oncost 2½ hrs. cost 2-6	
Total	8-3

—a clear saving of 5/3d per piece; same time limit and wage rate. The real danger is faulty job rates and low, not high, earnings.

P. E. James
Lindum, England

•

WHOSE BUSINESS?

In a changing and complicated political world with its natural repercussions on industry, we must all adjust our views to the course of events. As time goes on and the workshop rank and file become better educated and more interested in the "why" of industry, it behooves the higher ups to, at least, keep in step. In some cases it might pay to go one better.

In Britain today, with our program of full employment, we are beginning to see, here and there, something of a revolution in rank-and-file thinking. More and more of the men are interesting themselves in the economics of industry and the truth of the fact that more cannot, with safety be taken out of industry

BOSTON Gear
STOCKS ARE Here
at factory prices
Save time and money—assure yourself of uniform quality and parts interchangeability by standardizing on Boston Gear quality products—stocked at these Authorized Boston Gear Distributors — one near you!

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Owen Richards Co., Inc.
1309 2nd Ave. N.
BOSTON, MASSACHUSETTS
Chandler & Farquhar, Inc.
930 Commonwealth Ave.
BRIDGEPORT, CONNECTICUT
Hawley Hardware Co.
1320 Main St.
BROOKLYN, NEW YORK
H. L. Dieke
71-81 39th St.
BUFFALO, NEW YORK
Buffalo Bearings, Inc.
25 Terrace
Root, Neal & Co.
64 Pearl St.
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Samuel Harris & Co.
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Ohio Trans. Co.
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Wisconsin Bearing Co.
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Industrial Bearing Service, Inc.
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Jasper, Schilling & Skiff
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BOSTON Gear
STOCKS ARE Near

See for yourself why...

BOSTON Gear PILLOW BLOCKS

with the exclusive

SAFETY-VENT-SEAL

are your best buy

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Unique labyrinth seal automatically controls the correct amount of lubricant and prevents blowing out of seals. Keeps in lubricant while it keeps out dirt.

GENUINE BOSTON GEAR QUALITY IRON HOUSING!

Rigid, one piece, precision machined; providing a solid mounting in any position.

FULLY SELF ALIGNING!

Spherically ground outside bearing surface automatically aligns itself in the Boston Gear iron housing. This means accurate alignment of shafts — quick mounting, easy installation.

PRECISION BALL BEARINGS!

Precision ground chrome alloy ball bearings and Mirror-Finished bearing steel ball races assure smooth, quiet running and long life.

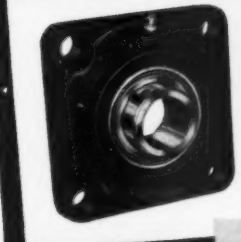
BOSTON GEAR PRECISION CRAFTSMANSHIP!

Over 70 years of experience and the most advanced tools and inspection equipment known to the industry.

FROM NEARBY STOCK!

BOSTON Gear PILLOW BLOCKS and FLANGED CARTRIDGES are stocked by *eighty* experienced, competent Authorized Boston Gear Distributors — one near *you*.

BOSTON Gear Self-Aligning, Precision Ball Bearing PILLOW BLOCKS with SAFETY VENT-SEAL



BOSTON Gear Self-Aligning, Precision Ball Bearing FLANGED CARTRIDGES with SAFETY-VENT-SEAL

WRITE FOR BOSTON GEAR CATALOG NO. 55

It contains complete information on BOSTON Gear Pillow Blocks and over 4500 stock items of quality power transmission equipment.

BOSTON GEAR WORKS

60 HAYWARD ST., QUINCY 71, MASS.

ONLY

GOSS *and* DELEEUW AUTOMATIC CHUCKERS

offer the* 1-2-3 *feature

2

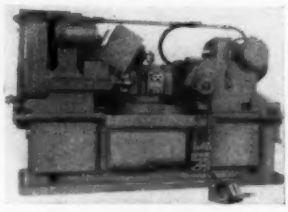
1

3

This NEW development—unsurpassed for speed, convenience of tooling and precise finish—involves no retooling problem even for short runs. It assures greater production at lower cost on all classes of work.

The unique "1-2-3" feature, exclusive with Goss & De Leeuw, provides the means for performing one to three right or left hand single or double threading operations simultaneously or in sequence, without changing set up.

Here's an ideal machine tool for small lot requirements because of quick, easy changeover. Any class of chuck work can be handled economically in any quantity.



The examples of work shown here are typical of the wider variety of parts being produced on these new machines.

SEND FOR detailed information on this new machine. Let us have samples of your work in order to give you time and cost estimates for handling it on the "1-2-3" Goss & De Leeuw.

GOSS & DELEEUW QUALITY PRODUCT QUANTITY

GOSS *and* DE LEEUW

MACHINE COMPANY, *KENSINGTON*, CONN., U.S.A.

than is put into it. This is having a salutary influence all round. It is no exaggeration to say that here, at least, the hot heads and the unthinking irresponsibles are having a much leaner time than hitherto.

Industry as a whole has nothing to hide, and if examination of isolated exceptions confirms that, here and there, the share out of salaries and wages is disproportionate to the profit earned, that is a matter for adjustment, and it is everyone's business to see the necessary remedial measures are applied. While, as previously indicated, industry as a whole is sound, the quest for something for nothing is not a sin of the rank and file alone. The stock market furnishes a useful indication of the shape of things in this connection and if a share is quoted at several times its par value the reason might well be inquired into. Quite recently, I heard a bench hand express his views on the matter at a production discussion group meeting. His argument was that there is no moral justification for a share standing at three or four times its par value. He held that in such circumstances that there was a screw loose somewhere. Either the works personnel was underpaid or the consumer was being overcharged for the product, or the company might be guilty of both offenses.

He argued logically and convincingly and was all for a moderate increase in the employees' share of the profits, a fair return to the shareholders for the use of their capital and a drastic reduction in the price of the commodity in order to increase consumption, the final result envisaged being factory extension and more jobs available. Men holding such views—they are rapidly increasing in numbers—can safely be trusted with the fullest information concerning the front office activities. Two world wars have largely killed the secrecy which once enveloped what is commonly termed the financial side of the industrial picture.

In this enlightened age of free and liberal education, attempts at secrecy in such matters only create suspicion and suspicion does the rest by magnifying the most trifling of irregularities. As things are today, it is a safe bet that most of the office information regarding the state of the order book will reach the shops in any case, probably in an exaggerated and highly colored form. In the circumstances and in the interests of friendly industrial relationship it is good business to give the shops the fullest information regarding the state of the order book.

THERE'S MORE TO THIS PICTURE

than first meets the eye. You'll find the entire illustration from which this enlargement was made on Page 209.

"Close-ups"

. . . show you what goes on at Allied. Plant photographs, illustrating a wealth of modern equipment in four large factories, could only tell a small part of the story. You have to get *close* to many individual operations—in production, engineering or even clerical departments—to see the true picture of Allied's careful attention to even relatively unimportant details . . . all of which add up to good products and good service.

At Allied every phase of every job is *important.*

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ENGINEERS

TO TOOL AND EQUIP YOUR PLANT FOR THE BEST PRODUCTION ECONOMICS

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TO GET YOUR NEW PRODUCTION GOING AND KEEP IT GOING

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19651 JOHN R STREET DETROIT 3, MICHIGAN

INQUIRIES PROMPTLY ANSWERED

Ed need not be unduly concerned about demands for more money by the men since district rates usually prevail, one district may pay a little more than another but, broadly, the difference is not important. The state of the order book is very much the men's business and it is wise statesmanship on the boss's part to hand out good news when he can. Men will put that little bit extra into the days' work when they know that there's plenty on hand to follow on. The men don't really need to be told by the boss if trade is good or bad. There is usually ample evidence of either condition in the shops but they do appreciate being taken into the boss's confidence, and any action by him that kindles the glow of appreciation in the men's hearts cannot be bad for business. It is the least pleasant part of a foreman's job to call for an extra effort when he knows full well, and the men know, that the finish of the job means a day off.

C. D. Mackinnon
Airdrie, Scotland

•

SERIES BUSINESS

ALL WORK and no play makes Johnny a dull boy today.

If a supervisor has a good organization of men that are trained to do their jobs the right way, and to give a good day's work for their pay and a good supervisor or foreman that knows his men, and treats them as men individually and in a group, then such a supervisor can put up a score sheet for the ball game in different parts of his shop so that the men in the shop that are interested in the game will be able to see it from where they are working. There is no fear of slowing down or having spoiled work. In fact, the men will appreciate it and will sometimes produce a little more to show their appreciation.

I know of a shop where production was starting to fall off gradually. By the time of the World Series, production was so low that an investigation was made and it was found out that men brought in portable radios and they had them hidden while listening to the score in toilets. Bunches of men were rounded up with their ears to the radios. Then they put a stop to it. Many men went home on some pretext or another and that was that. Then stricter measures had to be taken to keep the men on the job. The management had to have extra men to fill in for the men that were steady. The company found out that during the ball games they needed

PUMPS

FOR COOLANTS, LUBRICANTS, AND ABRASIVE LIQUIDS

PUMPS

POSITIVE DISPLACEMENT AND IMPELLER TYPES

PUMPS

J. I. C. STANDARDS OR DIRECT MOTOR CONNECTED

PUMPS

FOR TWENTY YEARS— DEPENDABLE, ECONOMICAL, EFFICIENT

Pioneer

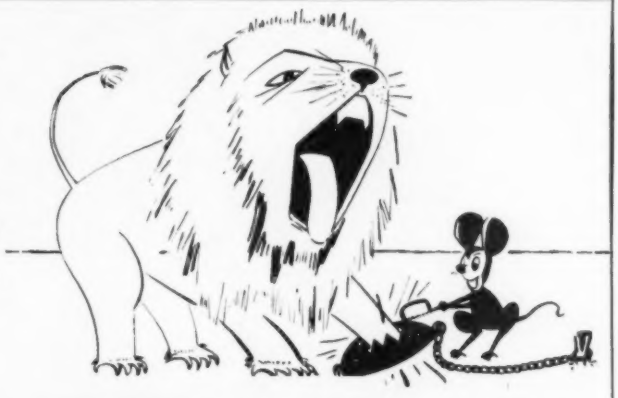
PIONEER PUMP & MANUFACTURING CO., INC.

STANDARD OR SPECIAL, FOR EVERY MACHINE TOOL AND INDUSTRIAL USE

19651 JOHN R STREET DETROIT 3, MICHIGAN.

WRITE FOR CATALOG

It's not size but performance that counts!



KRW HYDRAULIC PRESSES

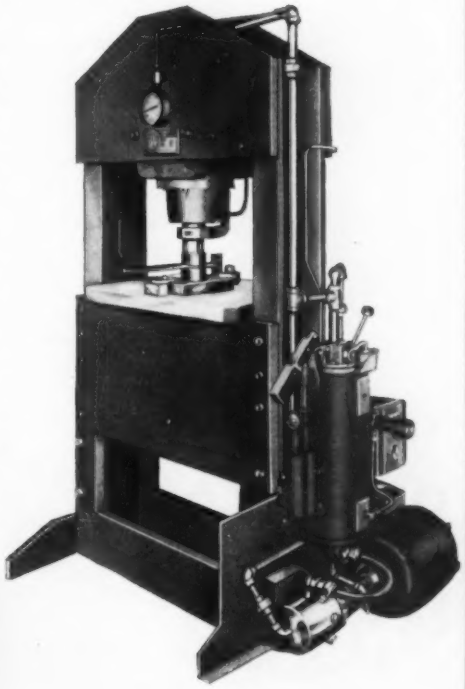
Do 101 manufacturing jobs BETTER!

Dollar for dollar, job for job, you can't beat the performance of KRW Hydraulic presses. In plants all across the country, KRW hydraulic presses are doing your kind of work at considerable savings in time and money. Speedy and adaptable, they tackle jobs formerly done on large, heavy-tonnage mechanical equipment. And they cost less to buy, less to install, less to operate. In one instance a customer found that the purchase price of a KRW hydraulic press was less than the foundation cost of heavier mechanical equipment recommended for the same job.

All KRW presses are entirely above ground . . . No pits or elaborate foundations needed . . . a big saving in cost and space. Available in capacities from 25 to 150 tons, hand operated, air operated or motor driven. They are quiet and vibrationless in operation . . . produce maximum tonnage at any part of the stroke. Platens can be stopped and reversed at any point in their travel. Investigate KRW hydraulic presses today. They can cut costs, boost profits for you !

If your work requires a specially-built press, let us know. Our engineers will come up with a press that fills the bill exactly.

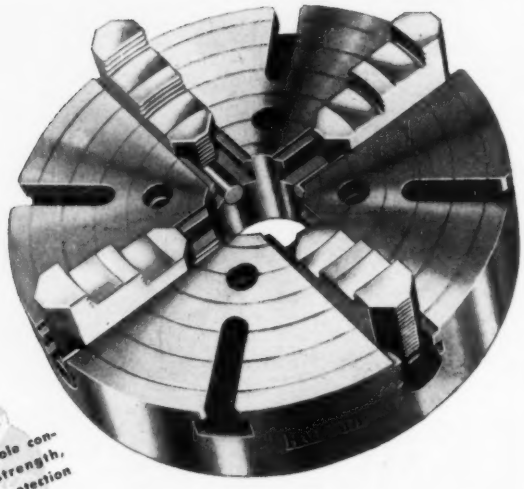
Ask your machinery dealer to quote prices. Or write or wire Dept. 11 for specifications and prices.



Illustrated is Model 3700F, KRW Forging Press—Capacity 75 tons. Other styles and sizes also available.

K·R·WILSON

215 MAIN ST. • BUFFALO, N.Y.



Exclusive pilot hole construction for strength, accuracy and protection from wear.

Chrome nickel steel scroll machined after hardening to Rockwell "C" 40-45.

Exclusive replaceable pinion bushings to reduce scroll and pinion wear.

Flame-hardened* jaw ways to prolong accuracy and gripping power.

One-piece body of forged steel for extra strength and longer chuck life.

Get these EXTRAS at no extra cost

Costlier construction features have given Horton Chucks their reputation for being *"built up to a standard — not down to a price"*. Yet *they cost no more.* Yes, it's true. The extras that Horton builds into every chuck mean greater accuracy, longer life and far better chuck value. Compare a Horton. Try a Horton — and you'll agree.

Write for literature and prices.

HORTON Since 1851 CHUCKS

*at slight extra cost

INDEPENDENT CHUCKS
SCROLL UNIVERSAL CHUCKS
SCROLL COMBINATION CHUCKS
TWO JAW LATHE CHUCKS
FACE PLATE AND BORING MILL JAWS

THE E. HORTON & SON CO.

Windsor Locks, Conn.

THE OLDEST CHUCK MANUFACTURER IN THE WORLD

extra men on their payrolls to replace the ones that were absent. Only those men who had no interest in ball games stayed on the job and did their full share of production. Among those interested in baseball there were absentees, lack of production and off-standard work.

Michael Axler
New York

•

BASEBALL is a clean sport and has, we believe, caused the most widespread and greatest interest among our people.

The game has aroused among those otherwise of staid habits an interest that leads them to go to the limit to get the news of the national game, and I believe that shops can profitably furnish a report of the games because of the good feeling and appreciation of the majority of their employees.

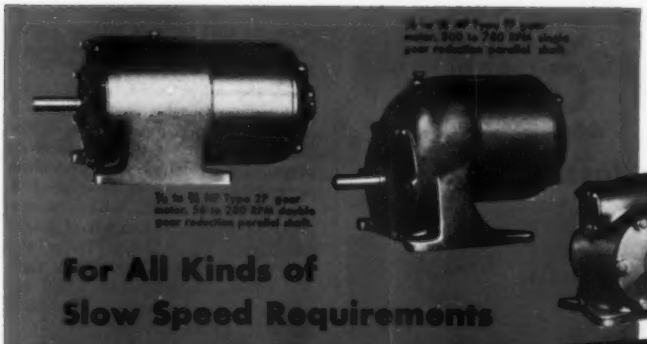
There are some local affairs and events that may be of enough importance to those of the immediate neighborhood which are of enough interest to them to be worthwhile to them for broadcasting in the shop.

John Mark May
Watervliet, N. Y.

•

THERE is no accounting for all the sundry effects publication of current baseball scores or news of other current sports might have on different types of workmen. A modicum of workmen would be largely indifferent about it. On such men, it would have little effect one way or the other. Those who liked to receive such news might have their goodwill for the company affected somewhat on the plus side, but whether the accruing goodwill would more than offset disadvantages to be faced is doubtful. There would even be the occasional forever-sourpuss to declare that a foreman or a company was trying to substitute such things to compensate for the fact that wages were too low.

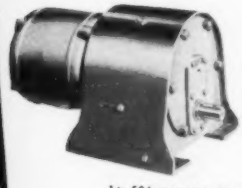
Leaving goodwill out of the picture, however, there would be some workmen whose production rate might actually be stimulated. This might easily be the case with workmen whose tasks are routine, and therefore call for little or no mental exertion. It is believed that in departments where all work might fairly be classified as routine, the publication of baseball scores would be definitely advantageous. Men on such jobs ordinarily do better production-wise when there is a legitimate outlet for their thinking, be-



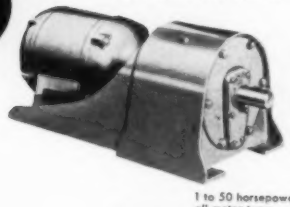
For All Kinds of
Slow Speed Requirements

Specify
Century GEAR MOTORS
Rugged, Quiet,
Long Life Operation

1/4 to 3/4 HP Type 2R gear motor. 4.3 to 125 RPM double gear reduction right angle shaft.



1 to 50 horsepower, gear motor.



1 to 50 horsepower all motor type gear motor.

1 to 50 horsepower, vertical all motor type gear motor.

There are dozens of reasons why Century gear motors assure satisfactory performance day after day. Here are a few of them:

Simple design, coupled with accurate machining and rugged construction, produces a rugged unit that stays in alignment.

Precision gear cutting assures quiet operation.

Streamlined design provides improved appearance and smooth easily cleaned surfaces inside and out.

Century Gear motors are available in a wide range of types and sizes from 1/8 to 50 horsepower—in a variety of speeds. Other Century motors are available in a complete range of types and sizes from 1/8 to 400 horsepower. Specify Century motors for all your electric power requirements.

2 to 3 HP gear motor Single gear reduction right angle shaft.

1/2 to 3/4 HP Type 1R gear motor. 25 to 280 RPM single gear reduction right angle shaft.

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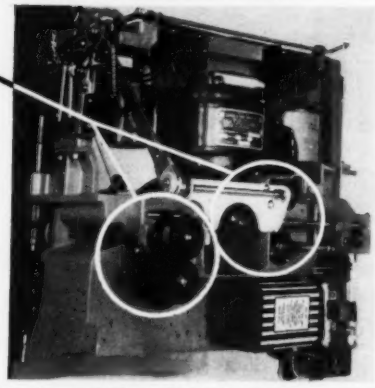
Mass. G&T Gear

Applied in Recording Instruments

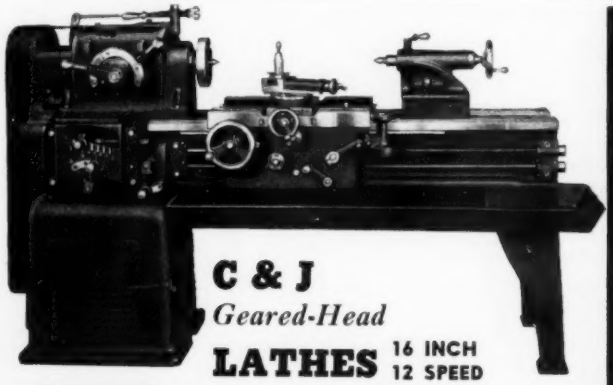


Leeds & Northrup Co., manufacturers of electrical measuring and recording instruments, automatic controls and heat-treating furnaces, have been using gears made by Massachusetts Gear & Tool Co. for over a quarter of a century.

The illustration shows typical use of "Mass Gears" in Leeds & Northrup's Speedomax Pyrometers.

If you have a gear problem, let "Mass Gear" help you. Write for free catalog to Massachusetts Gear & Tool Co., Woburn Mass.

Massachusetts Gear & Tool Co.



C & J
Geared-Head
LATHES 16 INCH 12 SPEED

ONLY ONE MODEL • ONLY ONE SIZE

FOR HIGH GRADE PRACTICAL GENERAL SERVICE

- Tooled and equipped for efficient production
- Exceptionally long carriage bearing—23⅜ in.
- Feed provided by separate rod—lead screw is used only for thread chasing

Complete regular equipment includes thread indicator.

Guaranteed accurate to good commercial standards. Write TODAY for new bulletin 38-A-8.

CARROLL & JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO

cause such an outlet greatly aids in relieving that form of fatigue which inevitably comes with tediousness and monotony.

On the other hand, where work being done is such as to require a high degree of concentration, nothing but harm could possibly come to production by deliberately providing something, no matter how good it might be in itself, which would serve to distract the minds of workmen from their tasks. There are also many instances in which such distraction would cause undue exposure to physical risk, with resulting high accident rate.

It follows that wisdom or folly of a policy of publishing baseball scores, etc., will necessarily be based quite directly on an analysis of the men and the work in a given plant. It is doubtful whether it would be wise to practice it in one department of a plant unless it could consistently be practiced plant-wide.

In this, as in other things, there is middle ground that can be taken, and in some plants it might be well to take it. Instead of publishing scores while a game is in progress, for instance, the news could in many instances wait until the game ended and the final score could then be placed on a bulletin board, or sent through the plant over any existing speaker system. Again, the score could be briefly reported at three-inning intervals, if that were thought best. Competency would certainly be better maintained by workmen who need to concentrate, under such a regime, than if they were attempting to follow the game more closely. After all, as Ed says, the plant is primarily a place to work. If and when that basic fact is forgotten to the extent that production is made secondary, in any industrial endeavor, it is on the way down, and eventually out.

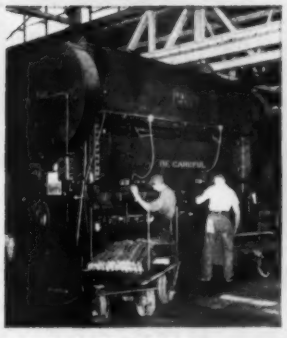
John E. Hyler
Peoria, Ill.

•

EMPLOYEES should not be allowed to gang up in front of the radio. They should not be allowed to run to the telephone and interrupt normal business matters. This is bad for the morale of the department and would have ill effects on production and quality.

However if we are interested in sports we want to know the score and so does the average employee. This is especially true during the World Series. When it is necessary for the foreman to say no to the employee he must let him know why. The foreman then starts looking around for

35 Rough, Tough Years... Total Clutch Repairs $50



Minster Press #50-6-162-2563—double crank, double geared, twin driven. Capacity 135 tons, length of stroke 8". Area of bed 34½" x 162". Two speeds, either 20 or 27 strokes per minute.

Minster Press #50-5½-72-2564—double crank, single geared. Capacity 113 tons, length of stroke 8". Area of bed 31" x 72", strokes per minute 37.

Minster Press #50-5½-72-2216—double crank, single gear. Capacity 113 tons, length of strokes is 5". Area of bed 31" x 72". Strokes per minute, 37.

Minster Air Operated Combination Friction Clutch and Brake units set remarkable record at New Idea Division of Avco Manufacturing.

Here are the facts straight from Mr. D. F. Filter, master mechanic at the New Idea Division, Coldwater, Ohio.

"On our three oldest Minster presses, one installed in 1938, the others in 1940, I find the only maintenance we have spent on these clutches is $50 for replacement of the air distribution tubes on our oldest Minster."

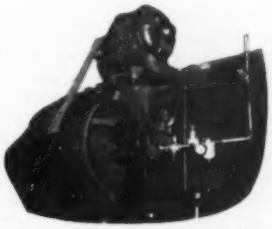
"We have additional Minster Presses equipped with the air clutches in our shop. However, they have been added in recent years and we have experienced no more difficulty than we have with the presses discussed above."

"Our jobs in the press room will average approximately 400 work strokes per hour for these double crank presses. Counting the amount of set-up, downtime, etc. we feel that 12 hours actual working time will be correct for a day. This amounts to 4800 strokes per day, 230 working days a year, 1,104,000 strokes per year, per press."

"During July, 1948 we converted 11 O.B.I. presses of another make to Minster air type clutch and brake units. To date we have experienced no maintenance on the clutches. Previous to that time we were spending $6,000 a year, labor and material to keep the original clutches in operation. This was accomplished on an investment of $17,000."

The next time the subject of press clutch design comes up remember this remarkable record. It is additional evidence to prove this statement . . . Minster's combination friction clutch and brake unit is the world's most trouble-free clutch design.

NOTE: *Much of the work on the above presses has been blanking and punching re-rolled rail stock. This material, due to its many variations, presents considerable difficulties in working as well as heavy operational shock to the machine. The box type frame construction offers maximum vibration dampening qualities — a design feature pioneered by Minster.*



This Minster air-operated combination friction clutch and brake unit on #50-5½-72-2216 has operated 13 years. This clutch and the others on Minster Presses at New Idea have never been disassembled.

MINSTER
FIRST IN Press DESIGN

THE MINSTER MACHINE CO., MINSTER, OHIO

Use Stainless Tubing and Pipe?

Call Ryerson for Quick Shipment

The country's largest stocks of stainless tubing and pipe await your call at Ryerson. On hand for immediate delivery are nineteen distinct kinds—both seamless and welded—in a wide range of sizes. Our stocks also include stainless pipe fittings and fastenings for every requirement.

The stainless tubing and pipe you get from Ryerson is of highest quality and meets the exacting requirements of A S T M Specs. You can count on its size accuracy and scale-free finish. You can form and weld it readily, thread it accurately. And when you call Ryerson, America's pioneer warehouse distributor of stainless, you put 25 years of practical stainless experience to work for you.

Ryerson protects the high quality of all stainless tubing and pipe stocks by expert handling. Our facilities include modern equipment to cut your stainless exactly to order and deliver it promptly. So, for complete stainless service, call your nearby Ryerson Plant.

STAINLESS TUBING AND PIPE IN STOCK

TP304 TUBING—
Seamless & Welded
TP316 TUBING—
Welded
TP304 PIPE—
Schedule 5—Light Wall—Welded
Schedule 10—Light Wall — Seamless & Welded
Schedule 40—Standard Weight—Seamless & Welded
Schedule 80—Extra Heavy Weight—Seamless
TP316 PIPE—
Schedule 5—Light Wall—Welded
Schedule 10—Light Wall—Welded
Schedule 40—Standard Weight—Seamless & Welded
TP347 PIPE and/or 304 ELC—
Schedule 5—Light Wall—Welded
Schedule 10—Light Wall — Seamless & Welded
Schedule 40—Standard Weight—Seamless & Welded
Schedule 80—Extra Heavy Weight—Seamless
STAINLESS FITTINGS & FASTENINGS— Screwed and welding pipe fittings, welding spuds, valves, bolts, screws, washers, etc.
OTHER PRODUCTS—Stainless, Alloy & Carbon Steels—Bars, Structurals, Plates, Sheets, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • DETROIT CINCINNATI • CLEVELAND • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS LOS ANGELES • SAN FRANCISCO

RYERSON STEEL

some other method that will work without any ill effects.

If the foreman is thoughtful of the employees' feelings he will come up with the right answer. In this case the scoreboard placed where anyone can see it or the loud speaker announcements would be the answer. If we use encouragement and the friendly approach we will keep resentment and discord out of the department and the shop. Frank discussions, a blending of thoughts and the pooling of ideas will make for peace and contentment. It is the best way I know to make the employee happy to do the job and arouse an eager want.

A. E. Salmons
Philadelphia

•

THIS discussion between Al and Ed shows that Ed is not geared to this day and age. He should have been a foreman sixty or more years ago when many foremen were tyrants, some of whom were damned mean ones too, in other ways.

Ed doesn't realize that today an operator does so much more work during each hour, nowadays, that when compared to those times, the old methods would be lost in the shuffle.

This debate between them, on the subject of baseball, comprehends only another item for improving management-labor relations.

In many plants, one can often see a man go to the next machine or further and discuss the ball games in which he may be interested.

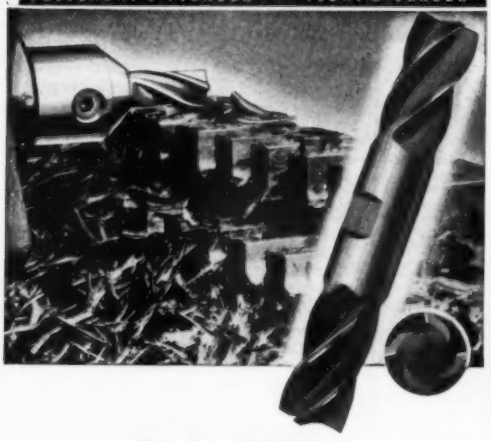
Such an act is OK in many cases, for an operator may be taking a cut on his machine which will require many minutes, and, after setting his tools for it, he will have considerable waiting time. A bulletin, showing the score of his favorite team will allow him to be free from concentration which will tire him and is a diversion which may turn to a profit which will not appear upon the company's records; in other words, he will get less of that element known as brain fag.

Since Abner Doubleday invented baseball over a century ago at Cooperstown, more and more people have become interested in the game, and the grapevine, in this case, is not the best method of getting fresh, interesting news.

One should remember that baseball is the great American game, and there are few, yes, very few, who are not interested in it.

Under most shop conditions such an act as posting a score sheet is for the relaxation of the men and it does not mean that the percentage

YESTERDAY'S PIONEER . . . TODAY'S LEADER



Weldon

Double-End End Mills

IT'S THE TEETH THAT TELL

It's the "teeth" in Weldon End Mills that tell the story of more production and bigger profits on your jobs.

Weldon pioneered in producing *scientifically designed* teeth for end mills, a step over 25 years ago that opened the door to higher speeds, and faster feeds.

After lengthy experiment and study, the *tooth shape* and *spiral angle* on Weldon End Mills were radically altered from conventional styles. The result was a tooth, that *allows chips to curl out without clogging* and *insures better performance* and *longer life* for the tool.

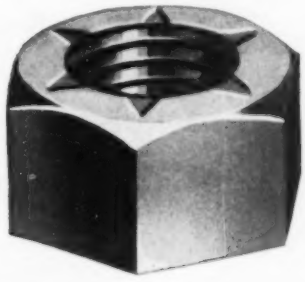
Call the Weldon representative for more information.

THE WELDON TOOL CO. Cleveland 4, Ohio
3000 WOODHILL ROAD

GRIPCO LOCK NUTS

PUSH PRODUCTION UP

Made to lock on bolts of varying tolerances —start on the Bolt easy, just like a common



nut. When the "double triangle" deflected Nut Threads (patented) engage the Bolt Threads, they make a secure "union", a "couple" that can only be "divorced" by a "wrench".

Locks wherever it stops. Its sustained holding power is unaffected by vibration, oil, water or chemicals. Can be removed and reapplied many times without appreciable loss of locking efficiency. *Available in Steel or Brass.* Made to fit National fine or National coarse thread bolts.

PUSH COSTS DOWN

GRIPCO PILOT-PROJECTION WELD NUTS

Save time and trouble. The circular Pilot centers the Gripco Weld Nut instantly, right over the bolt hole, for quick, accurate welding. No measuring. No jigs. No time wasted. Gripco Weld Nuts are available with standard threads or with Gripco Lock threads, and with two Pilot heights to fit different thicknesses of metal.

Samples and prices on both *Gripco Lock Nuts* and *Gripco Pilot-Projection Weld Nuts* will be sent promptly on request. Specify type of thread as well as sizes of nuts.

GRIP NUT COMPANY
310-C SO. MICHIGAN AVE., CHICAGO 4, ILL.
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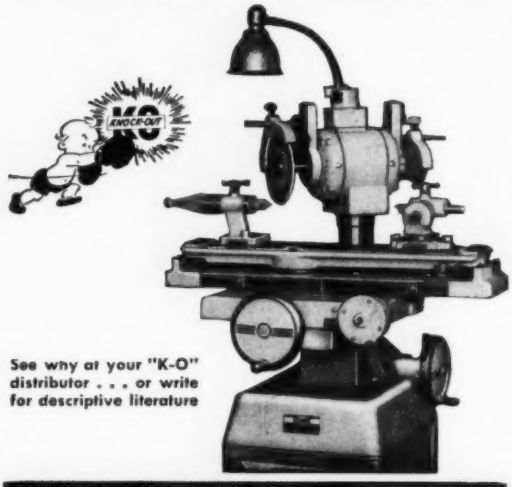
There's a reason . . . 85% of all popularly-priced Tool and Cutter Grinders sold are *"Knock-outs"*

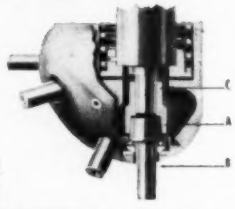


See why at your "K-O" distributor . . . or write for descriptive literature

K. O. LEE CO.
ABERDEEN, SOUTH DAKOTA

MORE HOLES
PER HOUR — PER DOLLAR

Increase production of any standard drilling machine by adding a Lign-o-matic, the *only* drill turret with the patented, self-centering principle that guarantees sustained accuracy equal to the drilling machine itself.



FOR ALL CONSECUTIVE DRILL PRESS OPERATIONS

PROVED PRODUCTION INCREASE — Turret indexes faster than tools can be changed or work moved to another spindle. A single Lign-o-matic will release 5 drilling machines for other work and still show increased production and reduced costs on original job.

VERSATILITY — Fits any standard drilling machine without altering the machine. Handles operations such as drilling, reaming, counterboring, and tapping (on reversible spindle machines), up to ½" diameter in any material.

PRECISION — Patented, self-centering tapered drive (A) automatically locks turret spindle (B) into exact alignment with drilling machine spindle (C) for sustained accuracy.

GUARANTEE — May be returned in 10 days for any reason for full refund of purchase price. Two-year guarantee against defective parts.

PRICE — Model D, 6 spindles with No. 2 Jacobs male taper $235.00
Chucks extra at established prices.

DELIVERY — Currently, 2 weeks.

☐ Please rush Lign-o-matic turrets for
(drill press make) ..... (size) .....
(quill dia.) ..... (spindle taper) .....
My name .....
Title .....
☐ Please send literature on Lign-o-matic turret.
(Attach coupon to company letterhead)

HOWE & FANT, INC.
522 FLAXHILL RD., SO. NORWALK, CONN.

of scrap will be increased nor does it mean that a higher accident rate will ensue. These are just points of argument for Ed, and don't mean anything.

As an example of a diversion project, read the following:

A number of years ago, a large plant in the Middle West tried a scheme which was revolutionary at that time.

They allowed one man, in all departments having less than ten men, to attend the game when the team was at home; in departments where more than ten were employed, they allowed one man in twelve to attend.

The chances were drawn from a hat during the noon hour.

Most of the fortunate men attended the game, but if one were not interested, he could sell his chance to another.

This worked out all right until one man won a chance and on the next three consecutive days, he bought chances so that he attended the game four days running.

It so happened that the manager of the plant knew this particular man because he, himself, liked to sit in the bleachers and hear the wit and comments on the game, so he recognized the man.

As a consequence, the system was changed slightly to prevent such a happening again.

The new rule was that no man should witness a game oftener than once a week except Saturday afternoon when the plant was closed.

This worked well and for several years it was followed and all lived happily.

The men worked more contentedly and were enthusiastically turning out good production each day.

Not only that but they went all out for the firm and the privilege of attending the games.

It was good management-labor relations and it paid off.

Of course there were discussions among the men at lunch and other times and this reduced the number of grouches and made every day more pleasant.

More firms might try something of this kind and get first-class results.

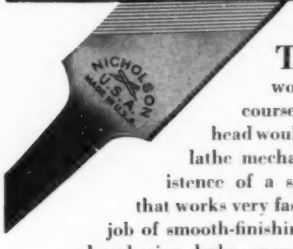
F. H. Stebbins
Worcester, N. Y.

•

THE COMPANY that is progressive enough to understand and try to improve employee relationships is far ahead of those companies who believe that the worker is only a cog and should never be greased. The old saying that you can catch more flies with honey than with vinegar

POP'S school of Filing

POP'S GIVIN' PINHEAD HIS FIRST LATHE FILIN' JOB
YEH, AN' PINHEAD'S ABOUT AS MIXED UP AS A BATCH O' CONCRETE
HE CAN'T FIGGER OUT HOW TO MAKE THE LATHE WORK THE FILE TO FILE THE WORK
THE KID MUSTA BEEN BORN TWISTED-AN' WITH NO BRAINS WOT-SO-EVER



THE lathe rotates the work and not the file, of course—as anybody but Pinhead would know. But not every lathe mechanic knows of the existence of a special Nicholson file that works very fast and does a beautiful job of smooth-finishing on spindles, shafts, dowel pins, hubs, gears, rolls — anything, in fact, that can be set up and spun in a lathe.

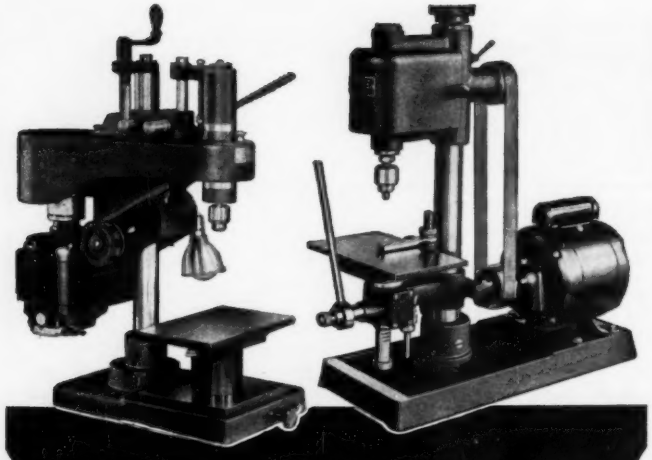
It's the Nicholson Long Angle Lathe File (also made in Black Diamond brand). Though a regular Mill Bastard will do a good job and is a bit easier to use, this special file, with teeth angle increased from 25° to 45°, has less tendency to fill up. The chips slide down the longer angle and are forced out at the edge by the "forward" motion of both the file and the work. Consequently, there is less chance of chip-scratches on the surface being smoothed. (A stroking action, under light pressure, should be used to distribute the cutting throughout the file.)

Made in Flat type with "Long Angle" stamped on tang; and sold through industrial supply houses. Unsurpassed Nicholson quality, of course.

FREE TECHNICAL BOOKLET, ***"10 Special File Types."*** Also, *"File Filosophy,"* Nicholson's famous 48-page illustrated book on kinds, use and care of files. *Free* — as many copies as you need for purchasing and production heads and key mechanics.

NICHOLSON U.S.A. **NICHOLSON FILE CO. • 29 ACORN STREET • PROVIDENCE 1, RHODE ISLAND**
(In Canada, Port Hope, Ont.)

NICHOLSON FILES ***FOR EVERY PURPOSE***



SMALL HOLES
(.004"— 5/16")

PRECISION HOLES
(Straight & Round)

Fast

SMOOTH HOLES THREADED HOLES

"AS SPECIFIED"

At spots where small, precision holes must be produced on fast production schedules, and where no excuse for failure to produce "as specified" is good enough, the Hamilton line of small hole, super-sensitive drills and tappers enjoy the full confidence of the men who are charged with responsibility for getting the job done.

Year after year, 80% of the sales of these machines are to those who know them through use.

For complete specifications, write for illustrated literature, today.

THE Hamilton TOOL COMPANY
812 SOUTH NINTH STREET • HAMILTON • OHIO • U • S • A

is certainly true in industrial relations. The employee likes to be considered worthwhile. He likes to be taken care of and helped.

Should we set up scoreboards? Well that is a question of company policy. Basically this is not sound practice. However, under some conditions it may work satisfactorily. The announcement of the scores inning by inning over the public-address system is the best method. Naturally if there is no such system then some other method must be devised. A scoreboard under this condition placed so that all workers can see it or at least located so that the worker taking his fatigue or personal time can observe it would be an ideal way of publicizing the scores.

It is true that workers will find out what is going on regardless. It is always better to make arrangements in advance and let the employees know what they can expect. This reduces the lost time which can and does occur in plants not giving the employee the data.

Another method which has been tried and in some cases resulted in success is the complete broadcast of major sports. This will work successfully only where the worker does not have to concentrate on his work to any extent. Shipping departments, packing lines and small assembly lines are the most likely places. The interference of machine noises in some sections would cause a hazard to the listener. In noisy locations the best method is to announce scores over the public address system. However, be sure that the announcer can be understood and that the frequency of the an-

"Oboy! Time for lunch!"

HOW DID SUNSET BLVD GET ON BROADWAY?

Everyone knows that it's hard to be in two places at the same time.

But recently, Paramount Pictures had to be in 387 places at once.

The release of their smash hit, "Sunset Boulevard," called for *simultaneous* openings in theatres on Broadways all over America. And although Gloria Swanson is being mentioned for an Oscar, Paramount feels there ought to be a special award for a star not even mentioned in the cast.

That's Air Express!

Thanks to Air Express, Paramount could work on the cutting, editing and printing of this film up to the last minute —and still get there on time!

But, you don't have to be in the motion picture industry to profit from regular use of Air Express. Here are its unique advantages which any business can enjoy:

IT'S FASTEST — Air Express gives the fastest, most complete door-to-door pick up and delivery service in all cities and principal towns, *at no extra cost.*

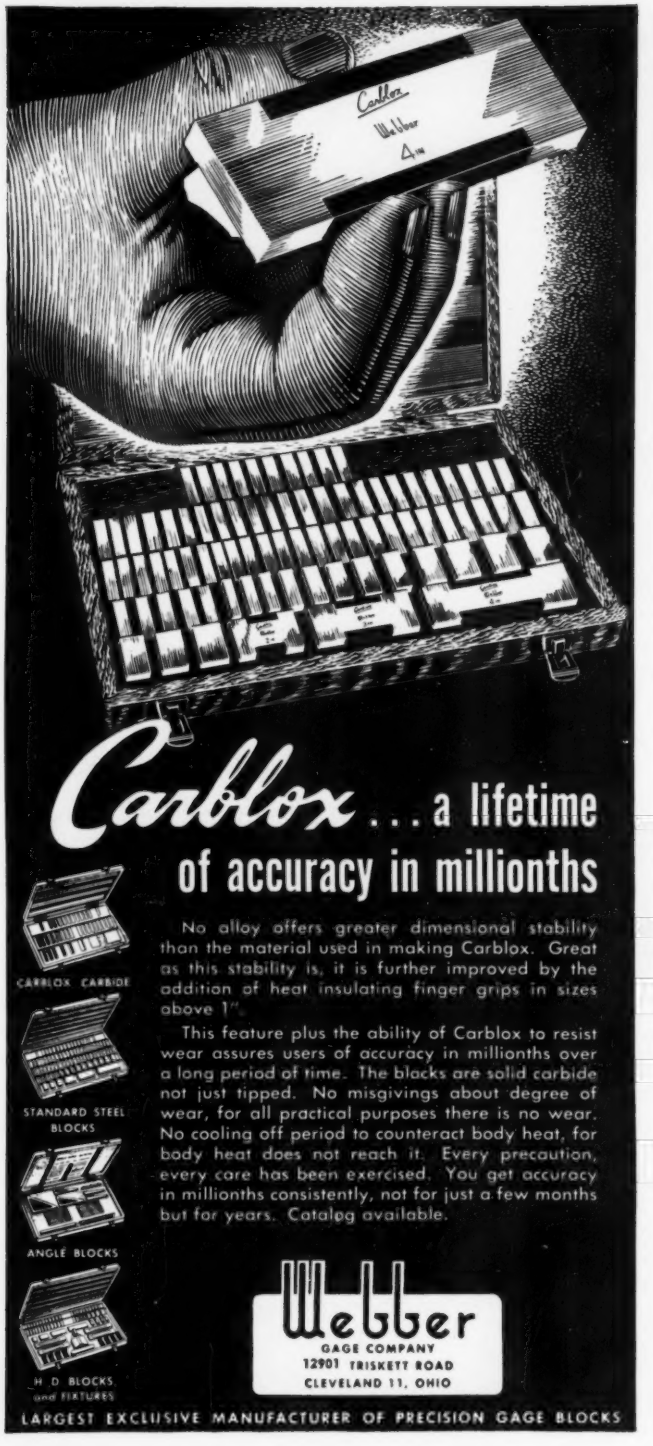
IT'S MORE CONVENIENT — One call to Air Express Division, Railway Express Agency, does it all.

IT'S DEPENDABLE — Air Express provides one-carrier responsibility all the way and gets a *receipt upon delivery.*

IT'S PROFITABLE — Air Express expands profit-making opportunities in distribution and merchandising.

Like to know more? Call your local Air Express division of Railway Express Agency.

AIR EXPRESS
GETS THERE FIRST



Carblox . . . a lifetime of accuracy in millionths

CARBLOX CARBIDE

STANDARD STEEL BLOCKS

ANGLE BLOCKS

H. D. BLOCKS and FIXTURES

No alloy offers greater dimensional stability than the material used in making Carblox. Great as this stability is, it is further improved by the addition of heat insulating finger grips in sizes above 1".

This feature plus the ability of Carblox to resist wear assures users of accuracy in millionths over a long period of time. The blocks are solid carbide not just tipped. No misgivings about degree of wear, for all practical purposes there is no wear. No cooling off period to counteract body heat, for body heat does not reach it. Every precaution, every care has been exercised. You get accuracy in millionths consistently, not for just a few months but for years. Catalog available.

Webber
GAGE COMPANY
12901 TRISKETT ROAD
CLEVELAND 11, OHIO

LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

nouncement is often enough to eliminate the workers' desire to wander off from the job to find out what was said last.

If your supervisors take the attitude of Ed, tell them that the workers will take their personal and fatigue allowance regardless. Remember that they are the ones who are earning the money. They can make or break a department and it is always better to have your employees for you instead of against you.

So let us keep our employees informed as to the outcome of major sports. This is a start to better relationship with the working classes. It gives a company a chance to utilize the public-address system for educational and entertainment purposes. It has its advantages. Don't let the problem become departmentalized. Handle it by a top-management policy.

Charles D. Townsend
West Hartford, Conn.

NEW BOOKS

STRENGTH OF STAINLESS STEEL STRUCTURAL MEMBERS AS A FUNCTION OF DESIGN—*By Michael Watter, Director of Research, The Budd Co., and Rush A. Lincoln, metallurgist, Allegheny Ludlum Steel Corp. Published by Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa. 153 pages. Price $5.*

This book describes a simplified procedure for calculating column failure that occurs through buckling in compression without twisting, behavior in bending and shear, and the analysis of open-section columns in compression that fail by twisting.

Data of the basic properties of stainless steel and the basic data on behavior of columns are included for reference.

This book should be extremely valuable to engineers and designers in evaluating the structural potentialities of stainless steel for airplanes, buses, railroad cars, bridges, and similar applications.

•

PLASTICITY AND CREEP OF METALS. *72-page symposium (STP 107). Paper cover. Published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price $1.50*

This symposium covers four out-

Continued on p. 184

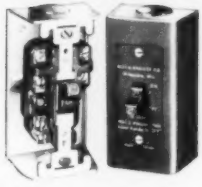
A COMPLETE LINE of MOTOR CONTROLS

Take your Pick—

Here are starters, contactors, relays, and pilot controls for all types of motorized machines. These devices . . . and many more . . . are listed in the latest Allen-Bradley Handy Catalog. Please send for it.

A-B Quality

FRACTIONAL HP STARTER
With Overload Breaker



Bulletin 600—Overload protection for your small motors.

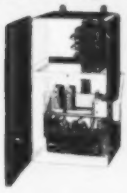
MANUAL STARTER
Across-the-Line Type

Bulletin 609—Most popular hand operated motor starter.

MANUAL STARTER
Watertight Enclosure

Bulletin 609—For installations exposed to moisture conditions.

MANUAL STARTER
Reduced Voltage Type

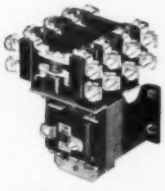


Bulletin 646—Transformer starter for sq. cage motors.

SOLENOID RELAY
D. C. Enclosed

Bulletin 200—Relays listed in many contact arrangements.

SOLENOID RELAY
A. C. Universal

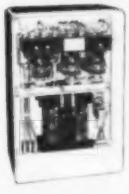


Bulletin 700 BX—Changeable from N.O. to N.C. contacts.

SOLENOID CONTACTOR
50 Ampere Rating

Bulletin 702—Contactors available up to 900 amperes.

AUTOMATIC STARTER
Reduced Voltage Type



Bulletin 746—Transformer starter for sq. cage motors.

SOLENOID STARTER
Size 1 • 5-7.5 hp

Bulletin 709—Most popular across-the-line motor starter.

SOLENOID STARTER
Size 2 • 15-25 hp

Bulletin 709—Magnetic starters for all types of service.

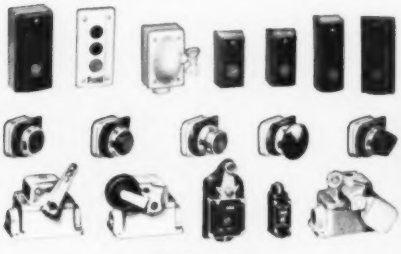
SOLENOID STARTER
Size 7 • 300-600 hp

Bulletin 709—The newest addition to A-B solenoid line.

COMBINATION STARTER
With Disconnect Switch

Bulletin 712—Saves space and makes neater installations.

STANDARD, HEAVY DUTY, AND OILTIGHT PUSH BUTTONS • LIMIT SWITCHES



See Next Page

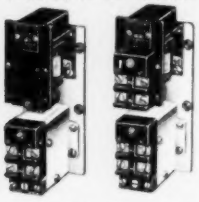
ALLEN-BRADLEY
QUALITY
MOTOR CONTROL
1316 S. SECOND STREET, MILWAUKEE 4, WIS.

SPECIAL PANELS • CONTROL CENTERS • ACCESSORIES

Allen-Bradley contactors, relays, and timers are widely preferred as components of special control panels. Their long, trouble free life accounts for their universal popularity with machinery builders.

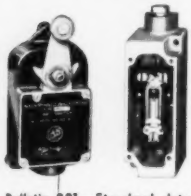
High production machines need automatic controls that are dependable and maintenance free. Allen-Bradley controls . . . good for millions of precision operations . . . are "tops" for performance and reliability.

PNEUMATIC TIMERS
From 1/4 to 180 Seconds



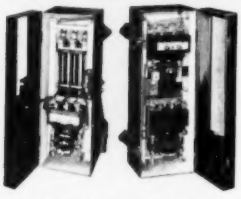
Bulletin 849—Dependable timer for a-c & d-c circuits.

LIMIT SWITCHES
Standard & Precision



Bulletin 801—Standard duty.
Bulletin 802—Precision duty.

A-C RESISTANCE STARTERS
Velvet Smooth Motor Control

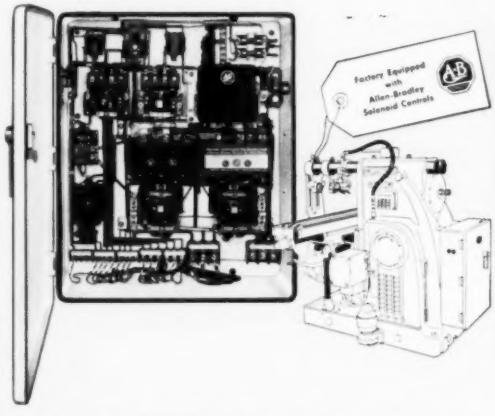


Bulletin 640—Manual type.
Bulletin 740—Automatic type.

D-C MAGNETIC STARTERS
For General Applications

Bulletin 265 with automatic time limit motor acceleration.

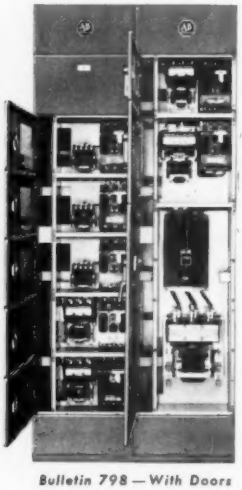
SPECIAL PANELS FOR SEQUENCE CONTROL
Any Size • Any Sequence • Any Machine



Special Panels—Allen-Bradley special control panels can be designed for any sequence of automatic operation of motor driven machines. Let us handle your control problems for you.

MULTI-UNIT CONTROL CENTERS
For Centralized Operation

Bulletin 798 Control Center—All controls are centralized in a neat, compact installation.



Bulletin 798—*With Doors Open*—Shows arrangement of various multi-unit controls.

A-B Quality

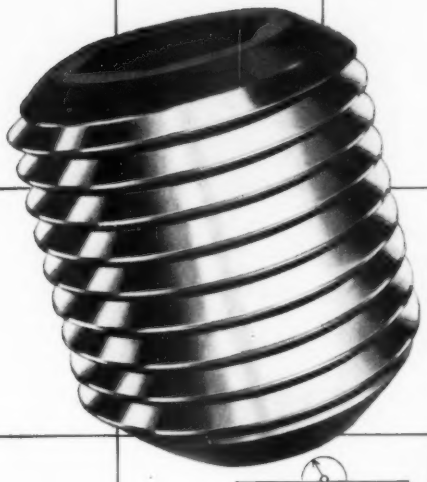
ALLEN-BRADLEY
QUALITY
MOTOR CONTROL
1316 S. SECOND STREET, MILWAUKEE 4, WIS.

STANDARD ENCLOSURES
For Every Service

See Preceding Page

Parker-Kalon GROUND THREAD Socket Set Screws

Give every department A LIFT



DESIGN

Ground Thread smoothness and accuracy plus faultless thread contour and lead make P-K Socket Set Screws first choice for a high quality product.

ASSEMBLY

Free from nicks, burrs and tool marks, P-K Ground Thread Socket Set Screws are consistently uniform and are made to close tolerances. Therefore they start easy, drive easy — keep assembly humming.

INSPECTION

With a dependable Class 3 Fit, every P-K Socket Set Screw is made of high-grade alloy steel, heat-treated to withstand severe torque and compression loads.

SEND FOR FREE SAMPLES

See and *feel* for yourself the difference thread grinding makes. Try them once, and see why so many Socket Set Screw users are switching to P-K. Parker-Kalon Corporation, 200 Varick St., New York 14, New York.

*TRADE MARKS REG. U.S. PAT. OFF.

SALES

Ground Threads, heretofore available only in precision equipment, provide an extra sales feature any shrewd buyer appreciates.

FOR ANY TYPE OF SOCKET SCREW—
REMEMBER—IF IT'S P-K* . . . IT'S O.K.
FLAT HEAD SOCKET CAP SCREWS • SIZE-MARKED SOCKET HEAD CAP SCREWS
• STRIPPER BOLTS • GROUND THREAD SOCKET SET SCREWS • PIPE
PLUGS • HEX KEYS • AVAILABLE THROUGH ACCREDITED DISTRIBUTORS

P-K TRADE MARK

PARKER-KALON*

cold-forged

SOCKET SCREWS

OUT OUR WAY
OH, WHAT LUCK! IF YOU'D OF LEANED AGAINST ONE OF TH' OLD MACHINES, ONE HALF OF YOU WOULD OF WENT AROUND WITH TH' BELT AN' THE OTHER HALF AROUND IN TH' GEARS!
THAT KID WAS DUMB ENOUGH TO OVER-OIL HIS MACHINE, BUT QUICK-WITTED ENOUGH TO GET TH' BULL'S MIND OFF THAT!
THEY TEACH THAT NOW--PSYCHOLOGY! THEY OUGHTA TEACH ABOUT SOL-SPEEDI-DRI--AN' THERE'D BE NO SPILLS TO HAPPEN!
THE FAST TALKER
J.R.WILLIAMS

LABORATORY-TESTED
for consistent quality

SOL-SPEEDI-DRI

SLIPPERY FLOORS VAMOOSE when you use Sol-Speedi-Dri. It's America's largest-selling oil and grease absorbent. For good reason. Pound for pound, price for price, you can't buy a better product. Production controls and selective mining see to that... and laboratory tests safeguard its consistent quality. Adequate warehouse stocks in cities throughout the country — speedy delivery everywhere. Standardize on Sol-Speedi-Dri!

SPEEDI-DRI CORP., 210 W. Washington St., Philadelphia 5, Pa.

Warehouse stocks maintained in principal cities of the United States and Canada.

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Inquirers in New York, New England and New Jersey should write to Speedi-Dri Corp. Elsewhere in U.S. to Waverly Petroleum Products Co., 1724 Chestnut St., Philadelphia 3, Pa.

FREE SAMPLE: Fill out the coupon and mail today for big, free sample.

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standing phases of this subject—the plastic deformation and flow of metals—presented at the First Pacific Area National Meeting of ASTM in 1949.

The papers and their authors are: "The Experimental Exploration of Plastic Flow in Sheet Metals"—L. R. Jackson and W. T. Lankford, Battelle Memorial Institute; "Forming Parameters and Criteria for Design and Production"—William Schroeder, Lockheed Aircraft Corp.; "The Use of Creep Data in Design"—H. C. Cross and L. R. Jackson, Battelle Memorial Institute; "Super Creep-Resistant Alloys"—J. W. Freeman, D. N. Frey, E. E. Reynolds, and A. E. White, University of Michigan.

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JET AIRCRAFT POWER SYSTEMS. *Edited by Jack V. Casamassa, director, Engine Dept., Academy of Aeronautics, LaGuardia Field. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y. 338 pages, 5½ x 8½ in. Price $4.25.*

Designed for training courses on jet engines, this text covers data from history and theory of gas-turbine power sources through construction, installation, operation and thrust augmentation. Production problems, including characteristics of materials used, are discussed, and the treatment in general is practical rather than theoretical. It will thus give production men some background on operation of the "blowtorches," "oilcans," or "squirt jobs" they are making.

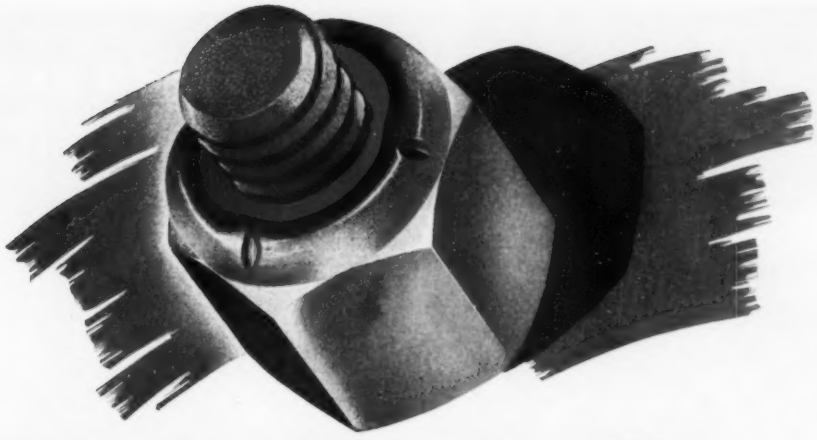
•

INDIUM—*Compiled by Maria Thompson Ludwick. Published by The Indium Corp. of America, 1676 Lincoln Ave., Utica 4, N. Y. 276 pages. Price $7.50.*

A complete study of the physical and chemical properties of indium and its possibilities as an alloying element with non-ferrous metals. Indium is still considered an ounce metal—rich ores contain 1.93 ounces per ton—but small quantities will generally produce the desired stabilizing effects.

Indium plate is generally not more than 5 milligrams per square inch. If diffused into the base metal by heat treating, a corrosion-resistant, non-porous surface is formed that is harder than the indium plate.

This book also includes a history of the development of indium and an annotated bibliography from 1863 to 1949.



ANCHORED *Forever*

•••OR RELEASED IN AN INSTANT!

The efficient Greer *Self-Locking* Nut solves many a tough engineering problem. So simple in principle . . . so easy to apply . . . *YET* so *powerful* in it's unshakable locking grip! It's 100% secure, clamped and *set* against every conceivable vibration! *Best of all*, an ordinary wrench unclamps it again in an instant!

VIBRATION TESTED FOR THOUSANDS OF HOURS

Probably the toughest test of all for GREER *Self-Locking* Stop Nuts is on pneumatic drills. Here they pass thousands of grueling hours of violent vibration with flying colors . . . NOT ONE has shaken loose to our knowledge.

GREER LOCK NUT MEETS THE ANA REQUIREMENTS

Where small but strong fastenings must be applied (and later removed) . . . are subjected to vibration and must stay ABSOLUTELY TIGHT . . . GREER *Self-Locking* Nuts have proved to be ideally suited.

GREER

Self Locking Nuts

GREERCOID COLLAR HAS DUAL ROLE!

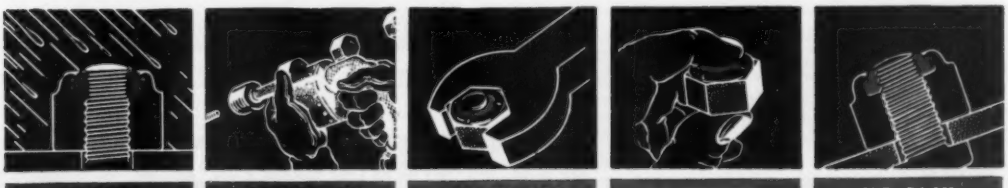
Flexible but extremely tough . . . the Greercoid Built-In Lock has just the right resiliency to "soak up" any "shortwave oscillation" attempting to start between nut and bolt. It also serves as a powerful set-clamp and braking surface. Compression plus flexibility give it an unshakable grip and generate much added holding power in the lower threads also. Greer Stop Nuts are identified by the label on the carton. Meets ANA requirements.

ALL SIZES FOR STANDARD OR SPECIAL THREADS

Write today, outlining your needs.

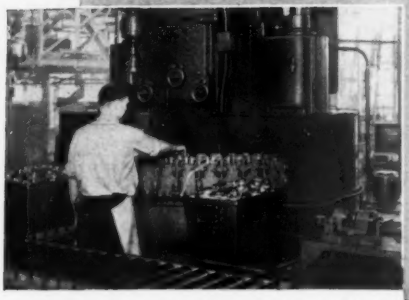
GREER STOP NUT CO.,
2620 W. Flournoy St., Chicago, Ill.

GREER STOP NUTS FOR APPLICATION IN ALL INDUSTRIES



WHERE THERE IS A FLAT SURFACE TO GRIND THERE'S A MATTISON TO GRIND IT.

40 hours before — now 4 hours. Pump case ground on Mattison Horizontal Spindle Precision Surface Grinder.



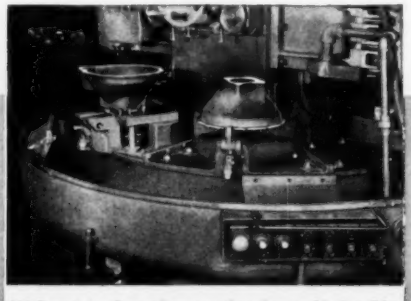
700 connecting rods per hour, using 40 station fixture to finish grind crank and wrist pin end of assembled rod with Mattison No. 72 Grinder.

With the addition of the production grinding machinery formerly made by the Hanchett Manufacturing Company, Mattison is now in a position to work with you on all your surface, face and disc grinding problems. These machines are made in various types to handle a wide range of work. Experienced engineers are available to give you best production efficiency, finish and tolerances, with Mattison machines.

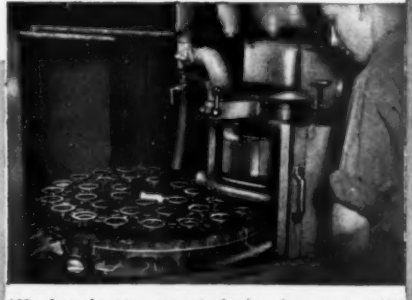
For any flat grinding ask for our recommendations on the proper method and machine for your job. No obligation, of course.

For catalogs on any of the types shown or if you would like a copy of the general bulletin, let us know and we'll gladly send them to you.

Grinding Cast-Iron Cams — 5" diameter, 1½" thick — stock removal, each side .030". Production 120 surfaces per hour on Mattison (Hanchett Type) Rotary Surface Grinder.



200 Transmission Case surfaces ground per hour on Mattison (Hanchett Type) Rotary Automatic Grinder. A special 8-station mechanical fixture permits one operator to grind each end of this large 35 lb. casting, flat and parallel. Stock removal .050".



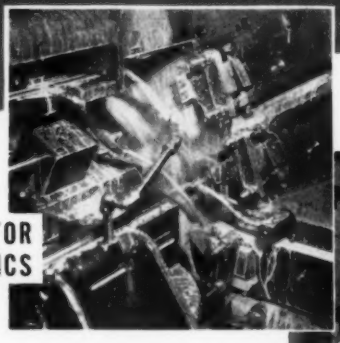
320 surfaces of cast iron compression heads per hour, removing 1/32" stock with Mattison No. 24 Rotary Surface Grinder.

MATTISON MACHINE WORKS

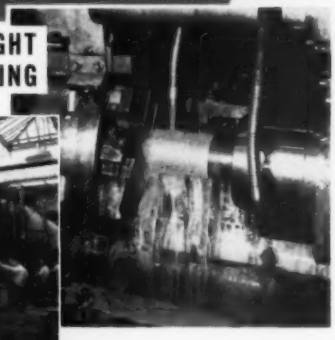
ROCKFORD · ILLINOIS

HOUGHTON'S ANTISEP

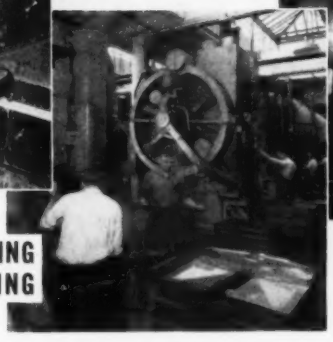
ALL-PURPOSE BASE



FOR AUTOMATICS



FOR STRAIGHT CUTTING



FOR STAMPING AND DRAWING

1 BASE . . .

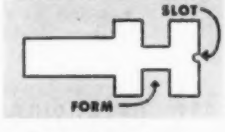
handles 90% of your machining operations—*including automatics!*

In tests and in use on toughest types of machining under all kinds of operating conditions, Antisep All-Purpose Base has proved to be definitely superior from every angle.

You can use Antisep A. P. Base to meet almost all of your cutting needs. The number of cutting fluids you require is greatly reduced—minimum handling, smaller inventory and less storage space are needed.

TYPICAL ANTISEP PERFORMANCE

"Tools lasted 12 times longer—and we've cut Oil Costs 82%"



In forming and slotting studs, using Stainless 403, a Cleveland manufacturer was paying 40c a gallon for straight cutting oil; tool life averaged only 10 minutes. When they switched to Antisep A. P. Base, tools lasted 2 hours—12 times longer! And Antisep, mixed 1 to 25 parts water, cost only 7½c a gallon—less than 1/5 as much!

You can dilute it with water for the most difficult machining operations previously reserved for straight cutting oils. And its exceptional cooling ability, safety, finish and speed fit Antisep for Automatics as well!

Antisep A. P. Base, high in anti-welding characteristics and fatty content, is antiseptically treated to eliminate rancidity and reduce bacteria growth. It cleans from work easily in any mild alkaline bath or by standard degreasers.

Ask the Houghton man to show you how you can reduce machining costs by using Antisep All-Purpose Base "across the board". Or write for bulletin and prices, to E. F. Houghton & Co., Philadelphia 33, Pa.

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"down time" costs more today!

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by using APEX TOOLS

• Any way you figure it — in hours, dollars or labor — "down-time" is expensive. And any way you can reduce "down-time" means savings in time, money and manpower.

You'll have less "down-time" using Apex tools—impact sockets, universal sockets, extensions and adapters — because Apex tools are designed and built to stay on the job, to provide greater freedom from excessive tool breakage and quick wear-out.

Apex manufactures thousands of standard types and sizes, each precision-machined from high carbon electric furnace alloy steel, cold broached and heat-treated to withstand the severe strains and shocks of industrial service. If yours is a special application, just send sketch or blueprint for prompt quotation, without obligation.

CATALOG 19 lists styles, dimensions, type and size of drives. Write, on your company letterhead please, for your copy.

APEX TOOLS sockets, extensions, adapters

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'Surface'

STANDARD RATED FURNACES

for TOOL ROOMS

THIS INFORMATIVE FOLDER
Bulletin SC-123, is fully descriptive of 'Surface' Standard Furnaces' application to tool room heat treat needs.

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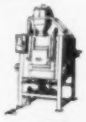
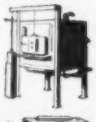
Balco, Char-Mo, Atmotrol for clean, scale-free heat treatment.



MUFFLE FURNACES
for use with protective atmospheres to prevent scaling and decarburization.



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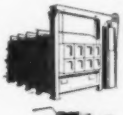
for general heat treating or heating operations. Direct fired.



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— a rugged, yet lightweight milling machine designed by Kempsmith engineers for the many "in between" milling jobs. It bridges the gap between low range hand millers and big, expensive machines . . . combines sound, rigid construction with flexibility and versatility. It's ideal for small end milling, high speed jig boring, keywaying, oil grooving, light straddle milling, etc. Ask for Bulletin No. 127.

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From The *American Machinist* Library of *Tips for Top Shop Men*

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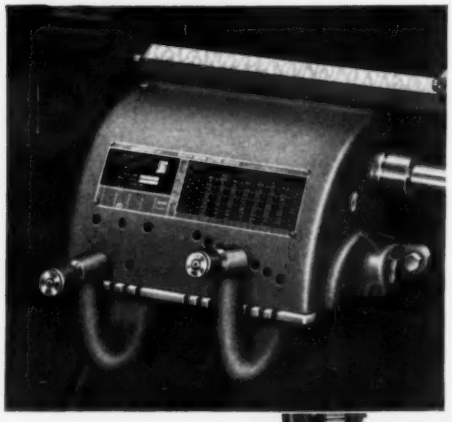
BE lazy, in a constructive way. Save your time and energy by doing things when they should be done—or even before. The soundly lazy man gets things done on schedule and avoids the hard work of catching up.

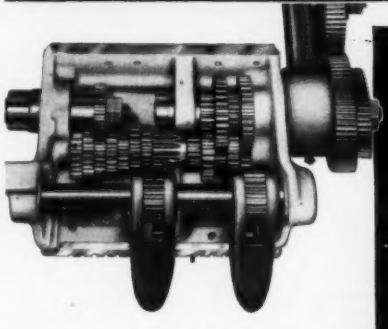
IMPROVED SOUTH BEND QUICK CHANGE GEAR MECHANISM *Saves Time*

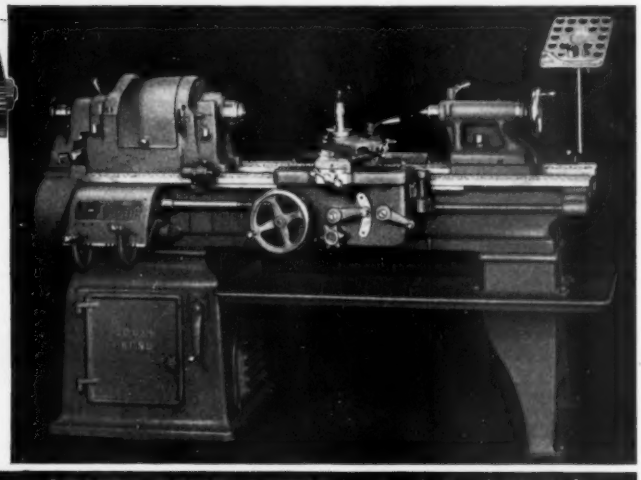


A new and simplified quick change gear mechanism is now supplied on all South Bend 16" Precision Toolroom Lathes. It has been designed to save you time and provide long, dependable service.

The direct-reading index chart shows the settings of the two conveniently placed control levers for power feeds and screw threads. Changing from roughing to finishing feeds requires moving only one lever. There are no clutches or primary sliding end gears to change. Special intermediate gearing for metric threads, diametral pitch worm threads and other unusual threads can be supplied to order and is easily installed. All gears and shafts in this easier running and sturdier quick change gear box are precision machined from selected steel.

This is just one of the plus-features that you get in a South Bend 16" Precision Toolroom Lathe.





16" x 6' Precision Toolroom Lathe with 8-speed drive, f.o.b. factory **$2538.00**

Above price includes standard toolroom attachments; drum switch and 1½ h.p., 220 volt, 3 phase, 60 cycle motor.

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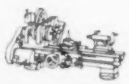
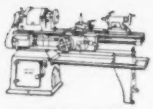
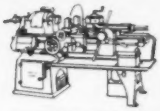
- ☐ LATHE ATTACHMENTS
- ☐ TIME PAYMENT PLAN



☐ 9" and 10" BENCH LATHES

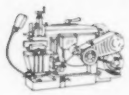


☐ 10" to 16-24" FLOOR LATHES



☐ 1/2" and 1" Collet TURRET LATHES

☐ 14" DRILL PRESSES



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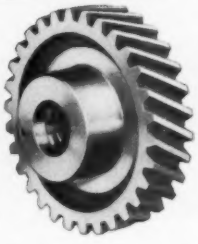

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10 Standard Models

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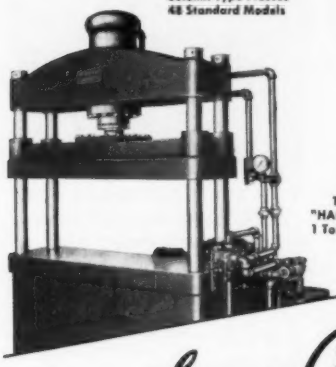

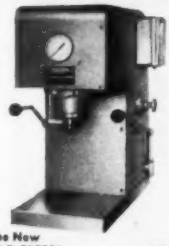

The New
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1 Ton and 2 Ton
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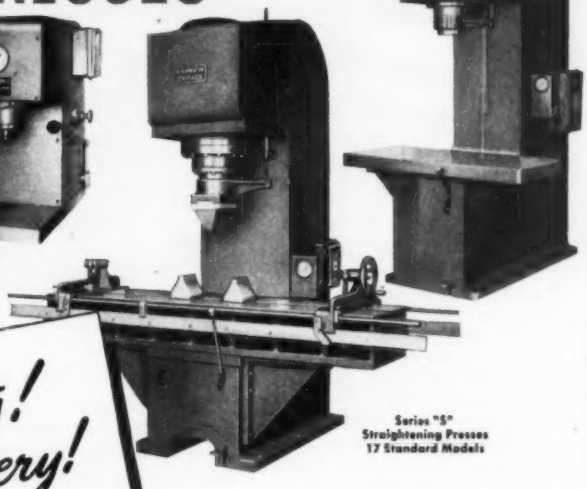

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17 Standard Models

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...SIZES ...TYPES ..CONTROLS *to meet Your requirements*

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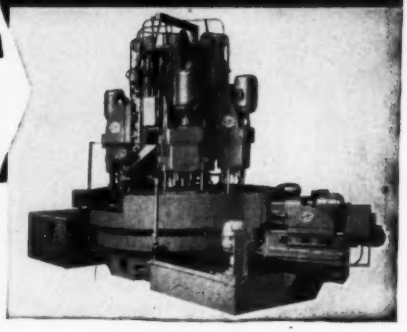
For High Production and Lower Unit Costs on Machine Tool Operations

...USE DAVIS & THOMPSON *Roto-Matics*



Here's a good example of the application of standard machine units to a special production job. Drilling and reaming operations of suspension support holes are performed on both right-hand and left-hand parts simultaneously. Drilling and reaming king pin holes is also included. Six stations, five operating and one loading, handle all operations with a total of 16 spindles. Machines of this type can be furnished from standard basic units for special applications on most all metalworking operations.

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Machines similar to this can be designed to handle dissimilar operations in the same parts or one operation on continuous production. An indexing table with ROTO-MATIC POWER HEADS is easily arranged to suit special machining operations.

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This machine is a good representative of the applications of D. & T. Roto-matic mechanical power heads. Six heads are used, three vertical and three horizontal. These new power heads lower maintenance costs through elimination of excessive servicing.

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Graymills Coolant Systems are made for 'round the clock operation . . . pumping coolants or heavy oils.

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RECOMMENDED AS REPLACEMENTS FOR MANY SMALLER COOLANT SYSTEMS WHICH ARE NOW BEING USED ON LARGER MACHINE TOOLS.

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GRAYMILLS CORPORATION

Evanston, Ill.

From the *American Machinist* Library of *Tips for Top Shop Men*

WATCH out for the man who wants to run up the ladder, or who feels he is so overcompetent in his job that he can handle a different and better one. The runner will misstep and fall; the over-competent may find himself in a job he doesn't really want — and at which he is not outstanding.

IF a man is bored and careless with his present job, promotion may *not* be the answer. A man must be able to handle one job well before he merits advancement. If he can't settle into this one, he won't settle into the one up the line. Self-discipline must be learned the hard way.

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Precision workmanship at low cost. Available in 1" steps from 0 to 6".

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PRECISION MEASURING INSTRUMENTS

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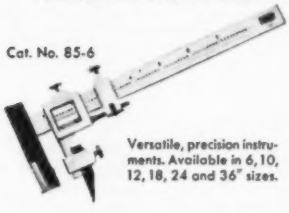

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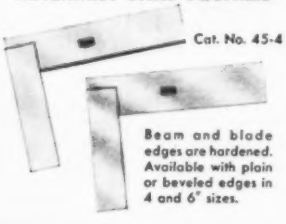

Cat. No. 45-4

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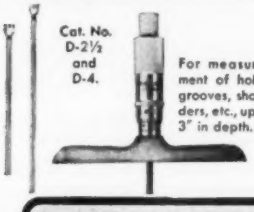

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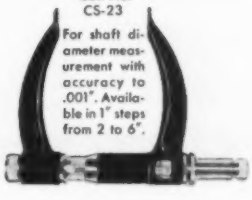

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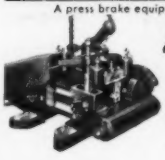

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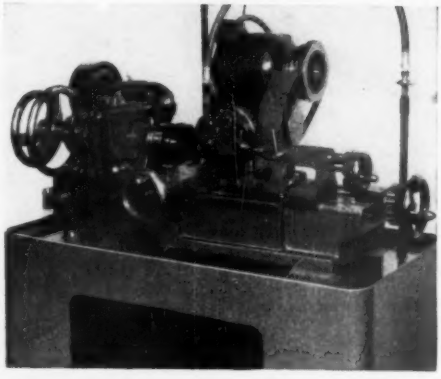

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An envious brother borrowed the mill. He commanded it to "grind herrings and broth and grind them good and fast." But having taken the mill in such haste, he didn't know the magic words to shut it off. He was almost drowned in broth when the brother came to the rescue.

Finally, the magic mill was stolen by a salt dealer, who put it on his ship. Safely at sea, the skipper demanded, "Grind salt and grind it good and fast." Alas, he hadn't learned the control words either. The mill ground salt endlessly, filling all his kegs and his hold, covering the decks and at last sinking the ship. There at the bottom of the sea, so people say, the magic mill still grinds--and that's why the sea is salty.

From time immemorial, men have dreamed about magic mills and schemes to bring abundance and riches. Here in America, today, there are plans that are flooding us with superabundance of certain commodities. But what about the magic words to shut off the mill?

Isn't it time we see the truth in this ancient Norse myth, that "too much" is just as foolish as "too little?" We may well remember this first law of economics: In a *free* market, supply can adjust itself to demand--whether it be potatoes or steel--without sinking the ship. Here is a must job for all thinking Americans.

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BE sure you are modernizing a *job*, not just a machine. A new piece of equipment never gets a fair chance if units ahead and after it are still ancient klonkers and if feeding and workhandling devices are inadequate.

How to read with your eyes open for **business**!

Read the ads! Every issue of this magazine contains ads that offer valuable services and useful products by which your business may oe run more profitably.

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This magazine displays more ideas and merchandise than a trade exposition. Make every issue your buyer's guide. Read the ads as well as the articles. That's reading with your eyes open for business.

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McGRAW-HILL publications

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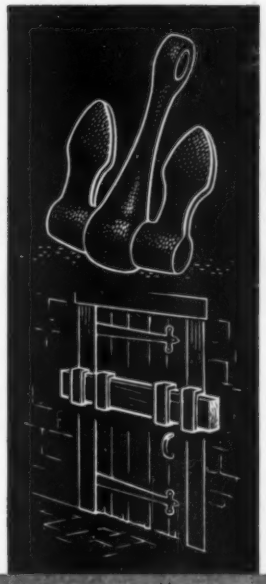
An anchor for paint . . .



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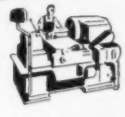

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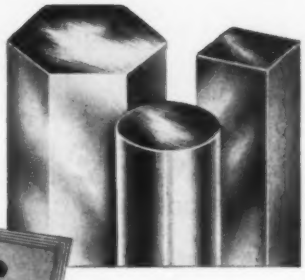

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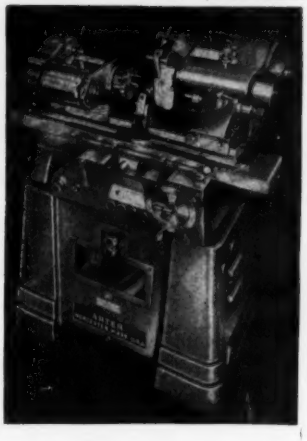

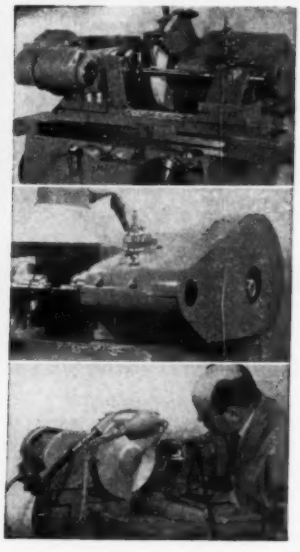

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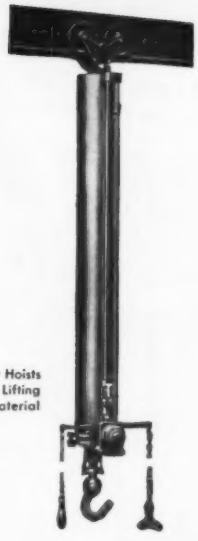

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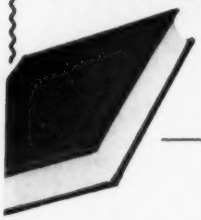

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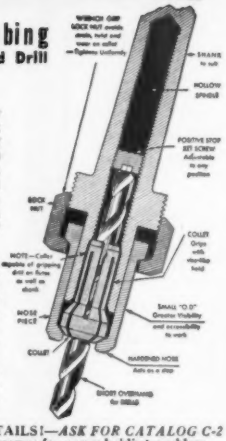

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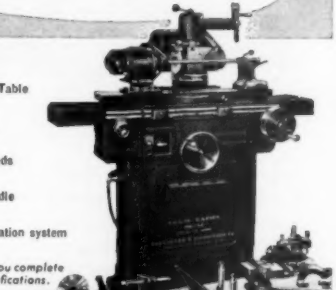

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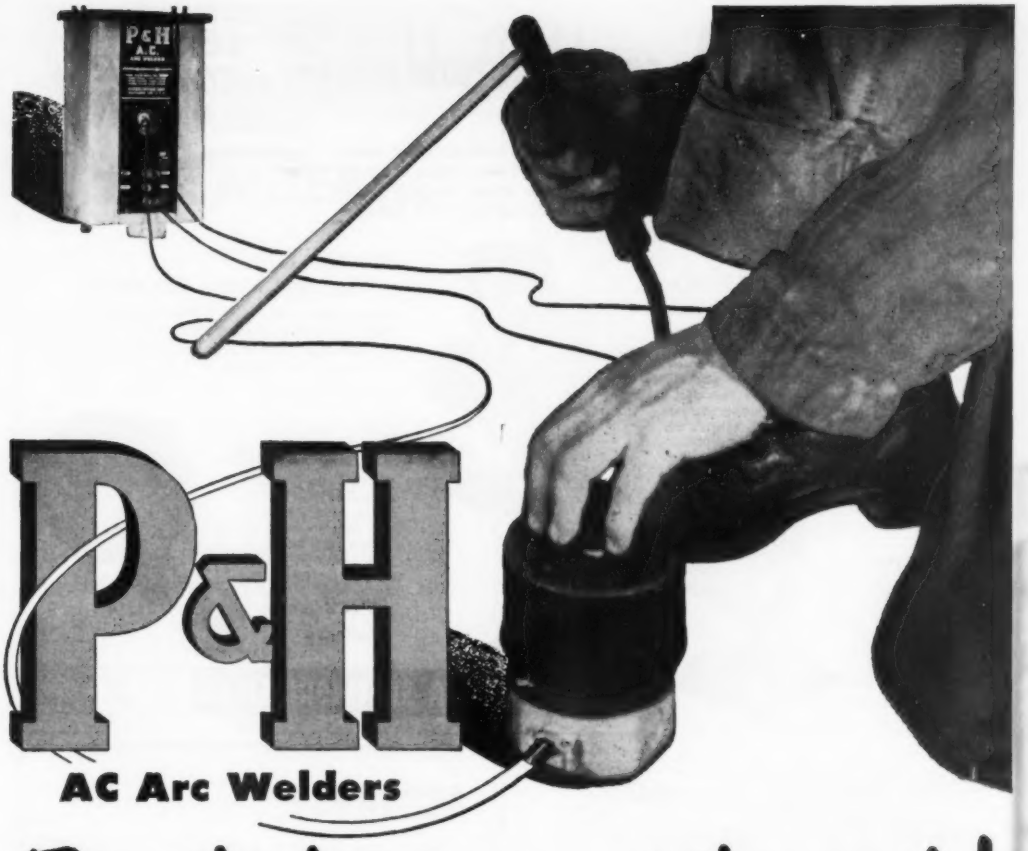

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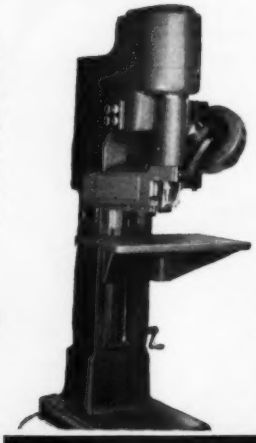

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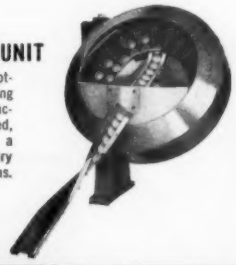

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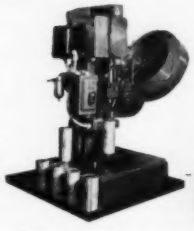

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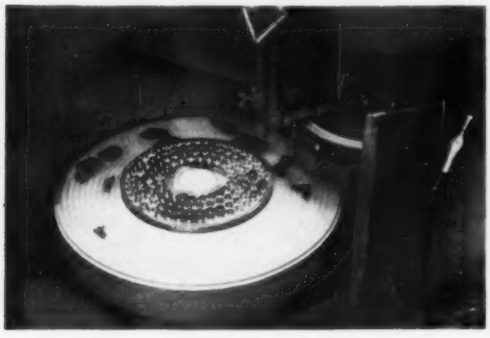

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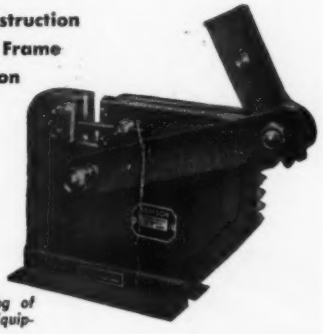

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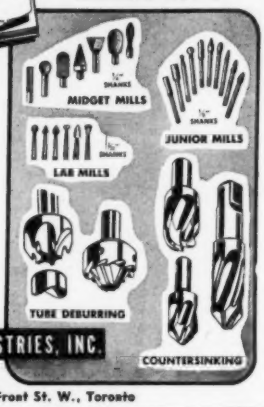

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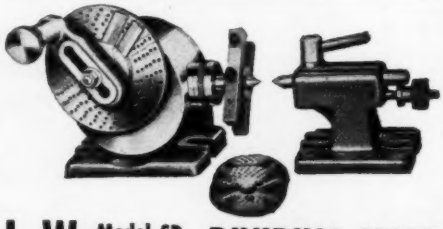

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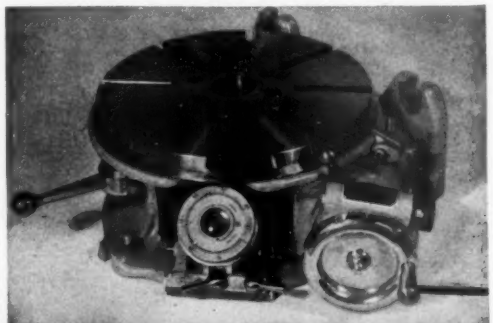

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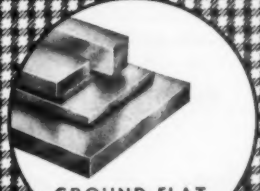

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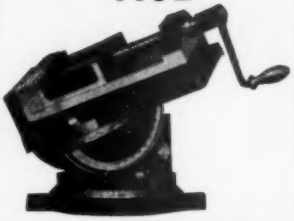

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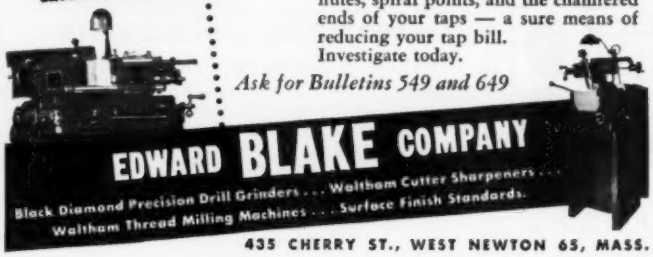

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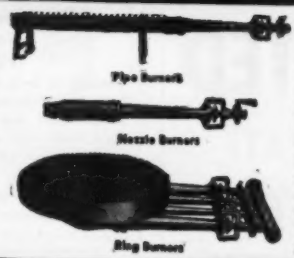

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DRILL, Avey-Matic #3 Hvy. 2-Spdl. #3 M.T. 24".
3—SPDLE. DRILL, Leland Gifford #2 MS—14". 11"
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DRILL, Natco #12 Multiple Spindle Motor Driven. #1 taper, 3 h.p. 220/440 motor. Arranged for 18 spindles. Rectangular head. With Natco 24" Rotary Table.

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SURFACE GRINDER, Horiz. #15 Covel 19½"x17½".
SURFACE GRINDER, Horiz. Leach 6"x12" Hand.
SURFACE GRINDER, Horiz. Thompson 18"x9" Hydraulic.
GRINDER, Cylindrical, Norton 10"x24" Hydraulic.
GRINDER, Cylindrical, Norton 6"x30" Hydraulic.
GRINDER, Cylindrical, B & Sharpe #4 Univ.
GRINDER, Cylindrical, B & Sharpe #10. 6x18.
GRINDER, Cylindrical, Cinci. 6x18 Hydraulic.
THREAD GRINDER, J & Lamson #TG-615 Automatic. Late Type
GRINDER, Blanchard #16, 26" Chuck Vert Rotary.
GRINDER, Landis Crank 10x32 Hydraulic.
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface.
GRINDER, Cincinnati #EA, 18" x 36" Hydraulic Cylindrical, Filmatic Bearings, 220 volts motors. Built-in electrics, Hydraulic infeed.
GRINDER, Norton 6 x 18 Hydraulic Vert. Rotary Auto. Excello Spdle.
GRINDER, Norton 6 x 18 Hydraulic Horiz. Surface. Excello Spdl.
GRINDER, Pratt Whitney 22" Vert. Rotary. 84" table travel.
GRINDER, Bath 10"x25" Motor Driven Universal Surface, 220/440 volts motor with centralized push button controls Internal Grinder Attachment & Steady Rest, etc.
GRINDER, Greenfield #12 Internal Hydromatic. 220/440 V.
GRINDER, Heald #79 Internal.
GRINDER, Pratt Whitney 14x36 Vert. Rotary.
GRINDER, B & S #2 Univ. Cylindrical
GRINDER, Heald #22 Horiz. Rotary
GEAR HOBBER, B & S #34 Spur. 10" dia.
GEAR SHAPER, Fellows #7 High Speed.
KEYSEATER, Mitts & Merrill #5 Giant Motor Driven, 220/440 volts motor, Capacity—24" long, 3" wide keyway, Automatic Feed.
LATHE, LeBlond 36"x30', 220/440 motor, 12 speed hood, taper attachment, steady rests, etc.
LATHE, 32"x16' Bridgeford Q.C.G. Grd. Hd.
LATHE, American 27"x16' Grd. Hd. 12 Speed. Taper attach. & chuck.
LATHE, 26"x18' Bridgeford Q.C.G. Grd. Hd.
LATHE, Bridgeford 26"x14' Q.C.G. 8'3" C.C. 220 volts two speed motor.
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LATHE, 10"x24" Logan #820 Q.C.G. NEW
LATHE, Hardinge #59 High Speed Second Operation machine, 1" Collet Cap Automatic Collet Mechanism, collets, collet chucks, etc., FOUR.
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LATHES, Turret, #1 Bardons & Oliver. ¾".
LATHES, Turret #2B Simmons Grd. Hd. 1¼".
LATHES, Turret, #2G Morey Grd. Hd. 1".
LATHES, Turret #4 W & S Univ. 1¼".
LATHES, Turret, #3A W & S Univ. 3½".
LATHES, Turret, #2 Simmons Grd. Hd. 1".
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MILLING MACHINE, Vert. #3 Cinci. High Power.
MILLING Machines, Vert. #4 Cinci. High Power.
MILLING Machine, Horiz. #2, #3, #4, #5 High Power. 220/440 Motors.
MILLING Machine, Horiz. #2SP Van Norman.
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MILLING Machine, Horiz. #3 Kempsmith Univer.
MILLING Machine, Horiz. #4 LeBlond Univ. Hvy.
MILLING Machine, Horiz. #1½ B & Sharpe Univ.
MILLING Machine, Horiz. #2 Kempsmith Univ.
MILLING Machine, Horiz. #2 B & Sharpe Univ.
MILLING Machine, Horiz. #3 B & Sharpe Univ.
MILLING Machine, Duplex, Cochrane-Bly #14 Univ. Mill & Shaper, #9 Taper. Shaper—0" to 6" Stroke. Rotary Table. 220-440 volts.
MILLING Machine, Duplex, Cincin. 24" Automatic.
MILLING Machine, Duplex, Van Norman #2.
MILLING Machine, Cincin. #4—36 Plain Hydmatic.
MILING Machine, Cincin. #4—36 Dpix. Hydmtic.
MILLING Machine, Prod. #1—18 Cinci. Hor. Auto.
MILLING Machine, Prod. #0—6 Cinci. Vertical.
MILLING Machine, Prod. #0—6 Cinci. Auto. Horiz.
MILLING Machine, Production, #12 B&S 18" Late Type (6).
MILLING Machine, Prod. #12 B&S 24" Late Type.
MILLING Machine, Horiz. K&T #2B Dble. Overarm. 220/440.
MILLING Machine, Horiz. K&T #3B Dble. Overarm. 220/440.
MILLING Machine, Horiz. Atlas Bench Mill, Like new.
MILLING Machine, Horiz. Nichols Hand Millers, late type.
MILLING MACHINE, Cincinnati Vertical #3 H.S. Dial Type, W/Rotary Table.
MILLING MACHINE, U. S. #MMI-8 Cam Controlled Automatic Horizontal, #40 taper, Late Type, 220/440 motors. TWO.
THREAD MILLER, Pian-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, #40 Spdl. Timken Bearing. THY-MO-TROL Control Unit. 5 h.p.
PIPE THREADER, Williams #3, 1½" to 6".
BOLT THREADER, Hill-Acme #1½-C Sgle. Hd.
TAPPER & THREADER, W & S #11R Dual Radial. Motor and Tooling.
TAPPER, W & S #1 Sgle. Spdle.
O.B.I. Press, Bliss #21B, 40 tons. 2½" Stroke.
POWER PRESS, Bliss #164 Open Back S.S.S.A. 65 tons, 4" Stroke.
POWER PRESS, Bliss #84 S.S.S.A. 35 tons, 18" Stroke, 20" between uprights.
POWER PRESS, Bliss #75½ S.S.S.A. 120 tons, 5½" Stroke, 24" between uprights.
POWER PRESS, Bliss #3A S.S. Dble. Crank S.A. Grd. 45 tons, 4" stroke, 36" between uprights.
WHEEL PRESS, Niles B & Pond 200 Tons Hydraulic Horizontal, 48" between strain bars, Two Plunger Type, 7.5 h.p. 220/440 motor.
POWER PRESS — Bliss - Consolidated #183 - B Straight Side Dble. Crank Single Action, 45 tons, 8" stroke, Bed area—24" x 41", 15 h.p. 220 motor.
PRESS, Thomas #7A O.B.I. 60 tons, 4" Stro.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Federal #2 O.B.I. 2" Stro.
PRESS, Federal #3 O.B.I. Grd. 4" Stro.
PRESS, Federal #4 O.B.I. Grd. 3" Stro.
GEAR SHAPER, Fellows #7G High Speed.
SHAPER, Vert., Pratt Whitney #8—6" Motor Dr.
SHAPER—Columbia 32" B.G. Crank.
SHAPER—American 24" B.G. Crank.
SHEAR, Gap Squaring Niagara #912GB. 10'x¾". Overdriven. 18" Gap. 20 h.p. motor, 220 V. spring hold-down and extra blades.
SHEAR, Morgan 120"x¾" Gullotine Plate, 36" Gap.
SHEAR, Quickwork #A-1 Rotary 60" Throat. 18 ga.
WELDER, Federal #712 AT Motor Driven Toggle Action Projection. New in 1938. 200 KVA. 10" throat. Stroke—1" to 3". With controls.
WELDER, Federal #624B Hvy. Duty Grd. Type 75 KVA. 1½" Stroke. 17" throat. Motor driven.

LATEST TYPES — GUARANTEED MACHINE TOOLS 1941-1950 MODELS

MILLING MACHINES
CINCINNATI: 2-spindle Vertical Hydrotal with two rotary tables.
CINCINNATI: #2M Vertical, Rotary table, P.F.
CINCINNATI: 0-S Vertical
SUNDSTRAND: 99 Rigidmill—Duplex (for milling cam tracks in propeller hubs or similar work)
SUNDSTRAND: #99 Rigidmill—Hydraulic
SUNDSTRAND: #9 Rigidmill
MOREY: 12M 2-spindle Profiler
TAYLOR-FENN: M-80 Duplex Spline
TAYLOR-FENN: Vertical 6"x21" Table, power feed
REED PRENTICE: #5 Vertical
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller

THREAD MILLERS & TAPPERS
MOREY: 12"x60" Thread Miller
LEES BRADNER: 40A Thread Miller
LEES BRADNER: LT 6x36" Thread Miller
HALL PLANETARY: B, C & D Thread Millers
MURCHEY: #22 Tapper, Horizontal
PRODUCTO: Hand Tapper
NATCO: Vertical Tapper 16 spindle

TOOL SHARPENERS
OLIVER: 2A Face Mill Grinder
OLIVER: 510 Drill Sharpener
OLIVER: 10" Tool Bit Grinder Template Type
FELLOWS: Flat Top Helical Gear Cutter
RANSOM: 2-wheel grinder 3 HP

GRINDERS—THREAD
EXCELLO: #31 & #33 External
JONES & LAMSON: TG84S External
JONES & LAMSON: TG124S External

GRINDERS—CYLINDRICAL
NORTON: 6"x18", & 10"x18", Plain
NORTON: 10"x18" 45° angle wheel head
LANDIS: 18"x18" "C" Plain Hydraulic
LANDIS: 18"x32" Type "D" Crankpin, Hydraulic
CINCINNATI: #2 Centerless
CINCINNATI: 6"x18" Hydraulic Filmatic
CINCINNATI: 10"x30" Filmatic
BROWN & SHARPE: #10 & #23 Plain

GRINDERS—INTERNAL
BRYANT: #5 and #5Y Internal
BRYANT: 10CH6 Internal
HEALD: #35 Planetary
HEALD: 70A Plain Internal
HEALD: 72A5 T-bed, Universal
HEALD: 72A3, 72A5 Plain & Universal
HEALD: 72A3 Sizematic Centerless
HEALD: 72A5 Sizematic
HEALD: 172 Sizematic for Cylindrical Cams
BRYANT: 112 Universal, Hydraulic
RIVETT: #104 Tool Room Universal

GRINDERS—RADIUS
VAN NORMAN: #73, 639, 849 Oscillating
VAN NORMAN: #3½ Universal

GRINDERS—SURFACE
THOMPSON: 8"x12"x18" Type B
HEALD: Rotary 8" dia. chuck
HEALD: #22 Rotary—12" Chuck
GARDNER: 120A Opposed Head Disc

HONING & LAPPING
BARNES: 306 H Vertical Honing
MICROMATIC: H-510 Double End Horizontal
MICROMATIC: H-2 Single End Horizontal
NORTON: #28C and 28F Hyprolaps
NORTON: #2Fx40" Diameter Lapper
SCHRANER: External Cylindrical Lapper with six Heads Model A

GEAR & SPLINE GRINDERS
PRATT & WHITNEY: 18" single & double wheel
GEAR GRIND MACH: GG-19 (18"x24"). Hydraulic Spur Gears & Splines also Internal
GLEASON: #17 Spiral, Zerol & Hypoid Bevel
MAAG: 5630 11¾" diameter

GEAR CUTTING MACHINES
BARBER-COLMAN: #3 Hobber
BROWN & SHARPE: #8 Cutter—72" diameter
CLEVELAND: #140 Hobber—1 spindle
FELLOWS: 6Z2 Shaper
FELLOWS: 6I, 6IA, 6AA, 7 & 72 Gear Shapers
FELLOWS: Straight Line Generator
GLEASON: 5" Straight Bevel Gear Generator
GLEASON: #12 Rough & Finish Generator
GOULD & EBERHARDT: 12H Hobber, 18" dia.
GOULD & EBERHARDT: 36BM Cutter
HAMILTON: #1 Hobber 6" diameter
SYKES: Gear Machinery (all sizes)

GEAR FINISHERS & TESTERS
FELLOWS: 8LSI & 13LSI Gear Lappers, External & Internal, Spur & Helical
FELLOWS: #12-G Spacing Tester
GLEASON: #13 Universal Gear Tester
GLEASON: #4 & #6 Bevel Gear Testers, Hand & Power Operated
GLEASON: 3" Bevel Gear Tester
ILLINOIS: 814 Center distance & concentricity checker
ILLINOIS: 806 Bevel Gear Hand Rolling Fixture
ILLINOIS: #224 Involute Checker and Recorder
RED RING: SIC-12" Gear Tester
FELLOWS: #6M Rod Liner

PRECISION BORING
BARNES: #612 Horizontal 60" Travel
HEALD: 48A Single End 2-spindle
HEALD: 48B Double End Barsematic

LATHES—PRODUCTION
POTTER & JOHNSTON: #4D Automatic
SUNDSTRAND: 8x15 Auto. Lathes
LODGE & SHIPLEY: #3A Duomatic
LIPE-ROLLWAY: 15"x30" Carbomatic
LEBLOND: 29"x48" Engine Lathe, raised to 40"

LATHES—TURRET
BULLARD: 24", 30" Vert. Spiral Drive
WEBSTER & BENNETT: Vertical Turret Lathes 36", 48" and 60" sizes
GISHOLT: 2L Saddle Type, Extended Bed
HERBERT: Turret Lathes (all sizes)

DRILLING MACHINES
AVEY: #2 Deep Hole Hydraulic
LELAND-GIFFORD: #2LMS Deep Hole Vertical
BARNES: 20¼ 2 spindle on 4 spindle base
BAKER: 30H0 2 spindle inverted 4" dia. cap.
BAKER: 217 Upright Heavy Duty 2" dia. cap.
FOSDICK: #48M Upright High Speed
PROVIDENCE ENG: 6-spindle ⅜" capacity
PRATT & WHITNEY: ½ Bx50 Deep Hole Reamer
ARCHDALE: Radial, all sizes (New)
WALKER-TURNER: D-1100F 1" cap. floor type
WALKER-TURNER: D-950 ½" cap. bench type

MISCELLANEOUS
CINCINNATI: 2-36 Broaching Machine
BLOUNT: Polishing Lathes 12x48
GARDNER: #6 Disc Grinder—20" 10 HP
ALLEN: #2 Stud Setter
CAMPBELL: #425 Abrasive Cutslater
WILLIAMS: 16" Pipe Cut-Off
TANNEWITZ: GH-36 Band Saw High Speed
KENT: 3¼" Bar Pointer and Chamfer
MATTHEWS: 79A Marking Machine
GENERAL: #33 Flexible Press
DENISON: 918-AM Hydr. Test Stand
OSBORN: 602 Jolt Rollover for Foundry
GENERAL ENGR.: Riveter 24" throat
WALKER-TURNER: Bench Grinder GR-50E ½ HP

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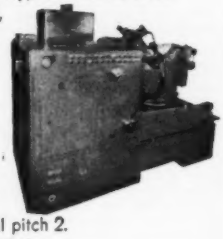

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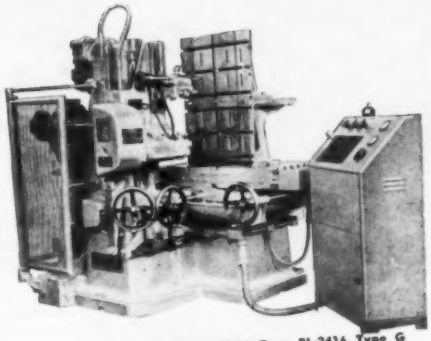

PRATT & WHITNEY (KELLER) Type BL-2416 Type G Copying Machine; 3 dimensional—Latest Type

BORING MILLS—HORIZONTAL

DETRICK & HARVEY 4" bar, Floor Type, M.D.
EXCELLO No. 54 Double End Borer, latest.
GIDDINGS & LEWIS No. 28T, 2½" bar, latest
NILES 5" & 8" bar, floor type, M.D.
SELLERS 5" Bar Table, Latest

BORING MILLS—VERTICAL

BULLARD 16" 6 Spindle Type A Mult-au-matic, M.D.
BULLARD 24", 36", 42" "NEW ERA" Motor Drive
COLBURN 72", 2-swivel heads, PRT, M.D.
KING 52"; 2 swivel heads; P.R.T.; M.D.
KING 62"; swivel, turret & side heads; high speed; latest type
NILES-BEMENT-POND 144" heavy duty; 2 hds.; M.D.
NILES 100", 2 swivel heads, PRT, DC, M.D.

BROACHES

CINCINNATI 1-30 Duplex Vert. Hydro, Latest Type
AMERICAN Model 6-G Hyd. Rifle Broach, latest type
LaPOINTE No. 5-42-S.R.V. Hydraulic; latest

DRILLS—MISCELLANEOUS

BARNES No. 420 Deep Hole, Latest Type
BARNES H-3, Hydram, Hyd., Invtd. Latest
NATCO D-5 Adjustable, Multiple, Late Type
LeBLOND No. 2 Deep Hole, Latest Type
BAUSH 1¼"x80" Deep Hole, Latest Type
FOOTE-BURT 20 Sp. Mult. Sp., Latest
NATCO No. 4AL 30 Multiple spindles, Latest

GRINDERS—CYL., PLAIN & UNIV.

BROWN & SHARPE No. 1, 2, 3, 4, Univ.
CINCINNATI 16"x36" Univ. Model ER, Latest Type
LANDIS 4x12, Type H plain hyd., Latest
LANDIS 6"x18", Type C, Pl. Hyd., Latest
LANDIS 14"x48", Type C, Univ. Hydr, Latest
LANDIS 29"x130" Centers, Plain, Motor Dr.
NORTON 10"x72" Type C, Plain, Latest
NORTON Model D-86, 17"x72" centers crankpin, hydraulic—Latest Type

GRINDERS—MISCELLANEOUS

BRYANT No. 3, 6, 16-C-16, 16-CP-16, 24-36" Internal Hydraulic, Latest Type
GLEASON No. 12 Tool Sharpener, Latest
HEALD 72A5 "Gagematic" Internal, Latest
HEALD No. 72A3 "Gagematic" Motor Dr.
HEALD 72A3, 72A5, Internal, Latest
KEARNEY & TRECKER Face Mill, Latest
LA POINTE 60" Univ. Broach Sharpener, Latest
SHEFFIELD Micro-Form Grinder, Latest
THOMPSON 6"x48" Auto., round broach, M.D.
VAN NORMAN 639, Osc. Radius, Latest

GEAR CUTTING EQUIPMENT

BARBER COLMAN No. 12 Hobber, M.D.
BILGRAM 6" and 16" capacity Bevel Gear Gen., M.D.
BROWN & SHARPE No. 13 Spur, Bevel Cutter
CROSS No. 1, #50 Tooth Rounder, Motor Dr.
FELLOWS Nos. 61A, 6Z2, 7A, 72, 715, 712a, 712, 725, 7, 77 High Speed Gear Shapers, Latest Type
FELLOWS No. 12M Involute Measuring Inst., Latest
FELLOWS No. 13LS Lapper, Latest Type
GLEASON No. 26 Hypoid Generator, Roughter and Finisher, Latest Type
GLEASON 3", 12" straight bevel gen., Latest
GLEASON 24", 37", 77", 96" Bevel Gear Planer, M.D.
GLEASON 4, 6, 18 Bevel and Hypoid Tester
GLEASON No. 14 Hypoid Grinder, Latest
GOULD & EBERHARDT 12H Hobber, Latest
GOULD & EBERHARDT No. 96H Hobber, M.D.
GOULD & EBERHARDT 18H Hobber, M.D.
NEWARK No. 6 Gear Hobber, 72" cap., P.R.T., DIFFERENTIAL INFEED, M.D.
P. & W. 10" Grinder, hyd., Latest
SCHUCHARDT & SCHUTTE No. 1 Hobber, M.D.

GRINDERS—SURFACE

ABRASIVE 3B 8"x24" Hyd. vert. Latest Type
ABRASIVE No. 34 Vert. Spdle. M.D., Latest
BLANCHARD No. 16A Vert., Dial Feed, M.D.
HEALD No. 22 Rot., 12" chuck, Latest Type
P. & W. 14"x36" "B" Hydr., Latest

JIG BORERS

KEARNEY & TRECKER model B Auto.
SOCIETE GENEVOISE (SIFF) No. 4 Precision, Table 19"x27", Motor Drive

LATHES—ENGINE & MFG.

AMERICAN 36"x40" centers geared, M.D.
AMERICAN 36"x360" cent., 2 carriages, M.D.
JONES & LAMSON "Fay" 24"x24", Auto., Latest
JONES & LAMSON "Fay" 20"x28" Automatic, Latest
LeBLOND 16"x30" Centers, Auto. Timken, Latest
LODGE & SHIPLEY No. 5x24" and 96" Centers, "Duomatic" Timken, Latest
LoSWING 4x60, 4x84, 8x60, 8x108, 5x34, Latest Type
MONARCH 10"x20" Mod. EE, Timken, Latest
MONARCH 16"x28" centers, geared-head, head, M.D.
MONARCH 22"x456", 3 carr. Tim. CM, M.D.
NILES "Time-saver" 30"x50' Boring, Timken, Latest
PRATT & WHITNEY 10"x20" centers, Bench, Latest
SPRINGFIELD 14"x48", 16"x24", Geared M.D.

LATHES—TURRET

GISHOLT Nos. 1L, 2L, Univ. Timken, Lat.
GISHOLT No. 3, Univ., Timken, Latest
MOREY No. 2G, No. 3, No. 4, Timken, Lat.
POTTER & JOHNSON 5D2E, Timken, Latest Type
WARNER & SWASEY 3A Univ., Motor Dr.

LATHES—RELIEVING

CLEVELAND 12"x16" Centers Cutter Reliever, M.D.
U. S. TOOL 810-B Cutter Reliever, Latest Type

MILLING MACHINES—PLAIN

BRIGGS Type 2A, 12" feed, Latest Type
BROWN & SHARPE No. 000, Timken, Lat.
BROWN & SHARPE No. 2B, No. 3B, Timken, Latest
CINCINNATI 0-8, Auto, Latest
CINCINNATI No. 3, 4, 5, High Power, M.D.
CINCINNATI 4-36, 54-36 Hydromatic, Simplex, Latest
CINCINNATI 4-48, 4 Sp., Tracer Latest
KEARNEY & TRECKER 1404 TIMKEN, Latest
KEMPSMITH No. 4 Maximiller, Timken, Latest
SUNDSTRAND No. 3 Rigidmil, Timken, M.D.
U. S. Mod MM-1-6 Auto, Latest

MILLING MACHINES—MFG.

HALL Style D Planetary, Latest
INGERSOLL 42"x38"x12" adj. rail, 4 hds., M.D.
INGERSOLL 32 x 24 x 16' Planer Type, 2 hds., M.D.
INGERSOLL 30"x42"x12' Adj. Rail Slab, M.D.
INGERSOLL 42"x42"x16' 4 hds., adj. rail, tubular ways, Latest
SUNDSTRAND Model 3A Duplex 42" Feed, Latest
TAYLOR & FENN M80 Duplex Spline, Lat.

MILLING MACHINES—VERT.

CINCINNATI No. 08, TIMKEN, Latest Type
SUNDSTRAND No. 3 Profile & Channel, Latest

MILLING MACHINES—THRD.

HALL Style D, Planetary, Latest
LEES BRADNER model HT, 12"x 54" centers, Latest
MOREY 12x30", 60", 120", 190" centers, Latest
PRATT & WHITNEY 4½"x12" Model C, Latest Type
PRATT & WHITNEY 6"x60" Model C, Latest
ESPEN LUCAS No. 670—20" esp. hydr., Latest

SAWS

HELLER Model SS-1, 6⅝" capacity Cold Saw, M.D.
MODERN No. 3, 3⅛" capacity Cut-off, Latest Type
PEERLESS 14"x14" Hydraulic, Latest Type

PLANERS

CLEVELAND 48"x48"x12' Open-side, A.C. M.D.

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LIBERTY 48"x48"x16' 4 hds. vari-voltage drive—Latest
LIBERTY 72"x48"x20' 4 hds. Convertible, openside vari-voltage dr.—Latest
NILES 108"x84"x42", 4 hds., Rapid Traverse, Box Table, D.C. Motor Drive
NILES 30"x30"x10'; 2 Hds, Box Table, Hyd., M.D.
SELLERS 60"x60"x12' 4 hds. vari-voltage drive P.R.T., Latest Type
WOODWARD & POWELL 54"x54"x20', 4 hds., M.D.

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BIRDSBORO 325 ton, vert. hyd., latest
CLEARING K-1200-30, 200 ton Knuckle Joint Press
GLEASON 15", 25", Quenching, Hyd., M.D.
LAKE ERIE 500 ton Vert., Hyd., Latest Type
NIAGARA No. 512, 400 tons, Late Type
NIAGARA No. 58, 106 tons, Late Type

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AMERICAN 20" Heavy Duty, Motor Drive
CINCINNATI 16", 20", 24" Hi. Sp. Latest
LAMAIRE 18" Vertical, Hydraulic, Latest
PRATT & WHITNEY 6" Vertical, Motor Dr.

SHEARS—POWER

PELS Type ME 10 Univ. Ironworker, M. D.
QUICKWORK ¾", 1" Capacity, Rotary, M.D.
ACME 2" forging, upsetting, Latest Type

MISCELLANEOUS

BAKER No. 5 Keyseater, Motor Drive
BAKEWELL No. 1, No. 1R Prec. Tapper
BARNES No. 172, 306H, 307, Vertical Hone, Hyd., Self-oiling, Latest
DeLAVAL No. 194 Coolant Clarifier, Latest
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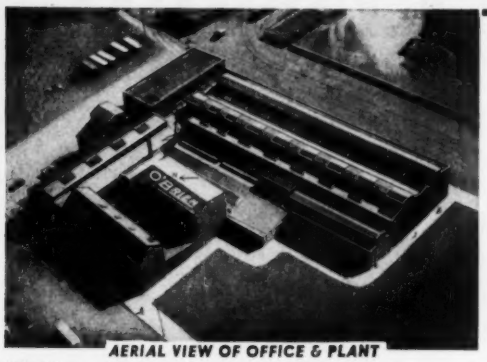

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Get the best! **Good machinery, properly reconditioned and fully guaranteed. Here are a few representative items from stock.**

48"x26' c.c. American "Super Productive," lathe.
#1-1B Cincinnati automatic miller, climb attachment, '41.
27"/58" x 12' c/c LeBlond sliding gap lathe.
20"x48" Springfield lathe, motor in base.
2—#2B Brown and Sharpe pl. millers, motor in base.
2—#5 Midland Universal turret lathes, preselect., '43.
2—#2 Simmons turret lathes, p. feed, '43.
3" Gleason bevel gr. generator, '42.

36"x36"x14' CINCINNATI "HYPRO" PLANER

#34 Abrasive Vert. Surface Grinder, late.
6"x18" Norton Surface Grinder, late.
#2A Brown and Sharpe Univ. Mill, Timken, M. in base.
2—16" x 10' Lodge and Shipley lathes, taper, M. in base.
#45 Giddings and Lewis 4½" horiz. mill.
3" Universal horiz. boring mill.
#2MS Leland Gifford 3 spdle. drill.
6" Oster "Rapiduction" pipe threader, M.D.

WANTED: Yes, we want good machine tools in any quantity. Call or write us today.

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LATHE—Engine, Mackintosh-Hemphill, 72"/110"x30' Centers (1943)
VERT. MILL—Cinc. Hydrotel #28/60, 4-spindles, Tracer (1942)
CRANE—150 Ton x 30' span, Whiting, Bridge, plus 2 Aux. Hooks 25 ton.
CRANE—Shepherd 3 Ton x 30' Span Floor Control.

BORING MILLS—D & H 3½" horiz. floor
Vertical Turret Lathe, 30'
Bullard 72", 2 swivel heads on rail (old)

CRANE—Overhead, 3 Ton x 30', floor control

DRILL PRESSES—Minster #2D, 2½" cap. Hvy.
Snyder, 1½", 28" swing

GEAR SHAPERS (2)—Fellows #6

FURNACE CONVEYOR—72"x24"x34' Electric & gas at 900° F.

GRINDER—Surface, Reid Model 2-1 (late)

LATHES—Engine, Logan 10"x4' cabinet
Engine, L & S 16"x30" C.
Turret, Simmons #2B—Bar 1¼"
Turret, Oster #601—1½" cap.
Turret, Foster #1B Universal, Chucker
Turret, Midland #5 Air Chucker (late)

MILLERS—Newton Vert. 42" Rotary Hvy.
Cinc. #3 Vert. Hi Power
Br. & Sh. #3 Universal
Cinc. #08 Vert. (late)

PUNCH—Sg. end, Smith 1-1/16" thru ⅝"

ROLLS, Angle—Bertsch 3"x3"x⅜"

ROLLS, Bending—H. & J. 30'x¾", Pyr.
Southwark 15'x3", Vert.

SHEARS—Square—Famco Power 36"x18g (new)
Alligator—(#2) 24" blade, 3" Rds.
Rotary—Quickwork #50A, 48"x¾" (late)

SPOT WELDER—75 KVA Federal

THREAD MILLS—Morey 12"x10' Centers (late)
Lees-Bradner 9"x36" centers

THREADER—Bolt—Acme 2½" cap.

PRESSES—Z & H #7, 50 ton percussion
Bliss #78½, 450 ton, 18" stroke

KINGS COUNTY MACHINERY EXCHANGE

408 Atlantic Avenue **Brooklyn 17, N. Y.**
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PLATE MOUNTED TOOL & CUTTER GRINDING WHEELS

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8 Spindle speeds. 6¼" hole in spindle. 18" 3- and 4-jaw steel body chucks, swing over ways 24", quick change gear, taper attachment. Large assortment of turret tools. Condition like new.

F. H. ROBERTSON COMPANY, Inc.
420 Broadway, Malden 48, Mass.

4" G&L HOR. MILL

Floor Type, 30" Spin. Travel, 54" Vert., 62" Hor., V-Belt M. Dr. New 1923—Little Used—$6500.00

ROSENKRANZ, WEISBECKER COMPANY
149 Broadway New York 6, N. Y.

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NEW and USED — HAND and POWER. Apron Brakes, Press Brakes, Shears, Forming Rolls, Power Presses, Pittsburgh Lock Machines, Spinning Lathes, Spot Welders, etc.

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HEAVY MACHINERY *and* SHEET METAL EQUIPMENT

Immediate Delivery ***Still in Original Location***

NO REASONABLE OFFER REFUSED!

SHEARS

CLEVELAND Vert. Trimming; type #443 cap. ½"x10"
COVINGTON Gate—cap. ¼"x30"
FERRACUTE PG-4, 1⅝" stroke
GARRISON Gate; cap. 1"x132"
LEWIS No. 5½ Alligator; stroke 5½"
LONG & ALLSTATTER Gate; "F" 1"x114"; "R" ½" x100"; "A" ⅜"x80"
LONG & ALLSTATTER Bolt; ½" rd.
MACKINTOSH HEMPHILL Bar; stroke 3½"
QUICKWORK Rotary ¼"
UNITED Alligator, 3" stroke

PRESSES—Hydraulic

BETHLEHEM 1200 ton; 66" stroke
MACKINTOSH-HEMPHILL (Upward) strokes 60", 36", 30", 24"
NILES BEMENT POND 4-post, 36" stroke w/ intensifier
PRESSED STEEL 21", 22" strokes
SOUTHWARK 5'6" stroke w/ intensifier

PRESSES—POWER

BLISS No. 10A, 12" stroke, 450 tons
BLISS No. 15, 20" stroke, 1200 tons
FERRACUTE 100 ton cap., 2" stroke
TOLEDO No. 88 single crank

POWER BRAKES

OHL—10'6½", 4" stroke
DREIS & KRUMP 12x½"; leaf-type

PUNCHES

HILLES & JONES No. 2 Horiz. 1½" strk. cap 1⅛"
HILLES & JONES No. 3 Vert. 2½" strk. cap 1" dia.
HILLES & JONES No. 2 Horiz. 1½" stroke cap 1⅛" dia.
HILLES & JONES No. 3 Horiz. 1⅝" stroke, cap 1⅛" dia.
HILLES & JONES No. 3 Dble. Hd. Vert. 2" stroke, cap. 1⅜" dia.
HILLES & JONES No. 3 Dble. Hd. Vert. 1⅜" stroke, cap. 1⅜" dia.
HILLES & JONES No. 2 Vert. 1½ stroke, cap. 1¼" dia.
HILLES & JONES No. 6 Vert. double head; 3" stroke
LONG & ALLSTATTER No. 2 Vert. 1⅛" stroke, cap. 1" dia.
LONG & ALLSTATTER Size B Dble Hd Vert. 2" stroke; cap 1" dia.
LONG & ALLSTATTER No. 3 Vert. 1½" stroke, cap. ⅞" dia.
CLEVELAND Mult. type w/ spacing table; 3" stroke
CLEVELAND No. 1 Mult. 6" stroke
CLEVELAND Vert. 500 ton IX; 6" strk.
CLEVELAND Mult. 3" x 120"
CLEVELAND EF Vert. 1½" stroke
CLEVELAND Type C Vertical; 1½" stroke
CLEVELAND Type C Dble Hd Vertical 1¼" stroke
CLEVELAND Type Z Punch & Bar Shear 4" stroke
CLEVELAND No. 1 Mult. Angle 2½" stroke
CLEVELAND "C" Dble. End; 1⅝" stroke
CLEVELAND Vertical No. 30 IX, 3" stroke
CLEVELAND Type A-1 Horiz. 1⅝" stroke
COVINGTON Mult. 6" stroke
COVINGTON No. 2 Vert. 2" stroke
MASSILLON No. 5 Ver. 2" stroke
MASSILLON No. 5 Ver. 1½" stroke
MASSILLON No. 5 Vert. 1⅝" stroke
WILLIAMS & WHITE No. 17 Vert. cap 1x⅝"
THOMAS No. 20 Mult. Moveable bolsters and spacing table—3" stroke
THOMAS No. 16, 3" stroke w/ spacing table
SOUTHWARK Mult; 400 ton, 7" stroke
MACKINTOSH HEMPHILL Vert. 2½" stroke

ROLLS—Bending & Straightening

CLEVELAND—Straightening—cap ⅜"x4'
HILLES & JONES Bending; length rolls 8" dia.

BENDING MACHINES

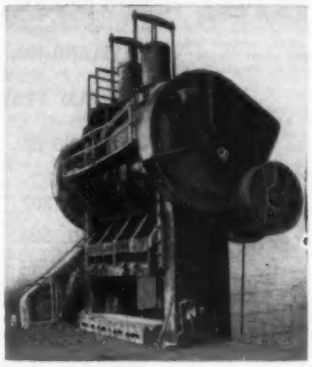
CLEVELAND No. 1½ cap 15" stand. I Beam
WILLIAMS & WHITE No. 2 Rail Bender 1¾" stroke

FORGING MACHINES—Upsetters

AJAX—Horizontal M.D. 1½", 2", 3½", 4", 5" cap.
AJAX Auto. Rivet; size openings 10x13

FORGING ROLLS

AJAX Brake Shoe Key
AJAX Lever Type



BLISS #15-20" stroke, 1200 ton Power Press—distance between uprights 150"; tie rod construction *(actual photograph)*

BULLDOZERS—Horizontal

PRESSED STEEL CAR—Hydraulic
WILLIAMS & WHITE No. 2
AJAX No. 7; 20" stroke

WHEEL PRESSES—Hydraulic

NILES BEMENT POND XX 400 ton

BORING MILLS—Vertical

BICKFORD 72", 2 heads
BULLARD 36", 42" N.E. type
NILES BEMENT POND 10-ft.

BOLT THREADERS

NATIONAL Double type—cap. 1"
NATIONAL Single type cap—2½"
LANDIS Double Head; cap. 2½"
LANDIS Double Head; cap. 2"

CENTERING MACHINES

WHITON 5'x8', 5½"x10" cap.
WHITON Double Spindle 4"x8" cap.
WHITON Double End Dr.—16"x60"

DRILL PRESSES—Single Spindle

BARNES 22", 28"
COLBURN D-2, D-4, D-5, D-6
BAKER w/ tapping attachment
PRENTIS 18"

DRILLS—Multiple Spindle

BAUSH 8 spdle. hd. 24x40"
MOLINE 6 spindle
NATCO No. 30, 12 spindles

DRILLS—RADIAL

AMERICAN 5' & 6', 15" columns
PRENTISS BROS. 4'6"
WESTERN 6' low-hung (1943)

LATHES

AMERICAN 18"x8', 24"x12'
BRIDGEPORT 18"x5'
BARDONS & OLIVER No. 1 (turret)
BOYE & EMMES 26"x12', 24"x12'; 20"x13'; 18"x8'
LeBLOND 18", 17"x8', 21"x10', 28"x16'
PITTSBURGH 38"x10'
SCHUMACHER & BOYE 26"x13'

MILLING MACHINES

JACKSON Vert. Mill & Die Sinker

GEAR CUTTERS

GOULD & EBERHARDT 60x12" Auto.

PLANERS

CLEVELAND 48"x48"x12' Openside; 3 hds.
DETRICK & HARVEY 48"x48"x14' 4 hds.
DETRICK & HARVEY 42"x42"x12' 4 hds.
GRAY 36"x36"x8'; 2 hds.
NILES BEMENT POND 48"x48"x12' 4 hds.

HAMMERS

ERIE single frame 2500#, 1100#
ERIE double frame 4000#
CHAMBERSBURG double frame 800#, 600#, 1500#
NILES BEMENT POND double frame forging 5000#
BRADLEY Cushion Hevel 80#
BRADLEY strap type 200#
BRADLEY Upright hevel type 500#

RIVETERS—HYDRAULIC

CHICAGO PNEUMATIC mounted w/ stand
CHAMBERSBURG Pinch—die gaps 8", 10½", 11½", 11¾", 13"
CHAMBERSBURG Deep Gap; die gap 25"
MACKINTOSH-HEMPHILL Deep Gap; gap 25"
NILES BEMENT POND pinch; die gap 9", 10"
WALKER pinch—die gap 14"
WOOD Deep Gap and Pinch, 10½", 12"

RIVETERS—PORTABLE PNEUMATIC

Approx. 75 machines:
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Strokes from 2¾" to 10"
RYERSON, HANNA, ALLEN, BAIRD, WATSON-STILLMAN

CARWHEEL BORING MILLS

BETTS 48"; table dia. 32"

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NILES double head—2 roughers; 2 finishers
NILES double head Burnishers
PUTNAM Dble End Center Drive center dist. 9'
BRIDGEFORD center drive, double end—12½"x9'

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NATIONAL 1" double head
NATIONAL 2½" single head
LANDIS 2½" double head
LANDIS 2" double head
PRESSED STEEL CAR 27" pipe bender
WALLACE pipe bender, 1 to 2" steel pipe

SAWS

HIGLEY No. 16—Cold, 20"
WRIGHT Band Hack, 15'10"
RACINE 6x6 high speed
ESPEN LUCAS Cold, 8" rd cap.
RYERSON 48" friction
GUSTAV WAGNER Cold; type DO2, 22"
AJAX Hot Saw & Burring, No. 2

WELDERS—D.C. 230 V.

HOBART ARC, 12 KW 300 amps M.G. set
WESTINGHOUSE 400 amps Flex-Arc M.G. set
WESTINGHOUSE 75 KW 300 amps Arc M.G. set
WESTINGHOUSE 300 amps Flex-Arc M.G. set

WELDING POSITIONERS

RANSOME hand tilt and turn; 20" dia. table

TURBO GENERATORS

WESTINGHOUSE — Parsons Exhaust type 3750 KW; 1000 KW; 625 KW; 500 KW

TURBINES

STANDARD size 20 HP steam pressure 150#
STANDARD size 60 HP steam pressure 150#
TERRY; 75 HP and 125 HP
WESTINGHOUSE 50 KW; steam pressure 150#

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TINIUS OLSEN Universal, cap. 600,000#
TINIUS OLSEN Cap. 50,000#

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BONNOT CO. Belt 50' and 85'
CHAIN BELT Port. Apron type; 24' length
DOW CO. Port. Apron type; 34' length
HEYL & PATTERSON—30'

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INDUSTRIAL—cap 30 tons, 50' boom
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PANGBORN type car blast, approx. 16'x20'x50'

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BLISS NO. 8-E . . . 255 ton, triple crank straight side, Twin drive. Bed 108" x 43". Friction clutch, double back geared, motor tie rod drive and motor with electrical controls.

TOLEDO NO. 95-C . . . 250 ton double crank, straight side. Tie rod double back geared press. Bed 60" x 40", 12" stroke. Friction clutch. Motor drive and motor. Weight 60,000 lbs.

TOLEDO NO. 96½-D . . . 450 ton capacity, double crank straight side, double back geared press. Bed 84" x 41". Twin drive, tie rod construction, friction clutch. Motor drive and motor with controls. Weight 140,000 lbs.

HAMILTON NO. 279 . . . 350 ton, straight side, Tie rod, single crank, single back geared press, 10" stroke, motor drive and motor and controls.

HAMILTON NO. 267 . . . 188 ton, straight side, back geared, tie rod construction. Motor drive and motor with controls.

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CLEVELAND NO. 24-S . . . 665 ton, straight side, single crank, twin drive, double back geared. Tie rod construction. Air cushions, motor drive and motor with electrical controls.

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SINGLE END				DOUBLE END	
Dia.	Price	Shank Size		Price	Shank Size
1/16"	$1.58	1/4"		$2.47	1/4"
1/8"	1.58	1/4"		2.47	1/4"
3/16"	1.58	1/4"	Effective	2.47	1/4"
1/4"	1.58	1/4"		2.47	1/4"
5/16"	1.58	1/4"	Dec. 18	2.47	1/4"
3/8"	1.58	1/4"		2.47	1/4"
7/16"	1.80	1/4"	to	3.15	1/2"
1/2"	2.05	1/2"		3.15	1/2"
5/8"	2.60	1/2"	Jan. 31st	3.87	1/2"
3/4"	2.90	1/2"		4.75	3/4"
7/8"	3.50	1/2"		5.65	7/8"
1"	4.00	1/2"		6.55	1"

All size long Single End End Mills in stock.
All 32nds sizes up to ½" in stock at next higher list prices.

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Serial #25600, Stroke 16", Shutheight 24", Bed area 36" left to right, 24" front to back, 115 ton capacity, Single back geared. Equipped with: Air operated friction clutch, tie rods, v-belt motor drive and motor, solenoid controls.
Diameter of crank at bearings 5½", at pins 6½".
Adjustment of slide 3". Width of opening in bed 23".
Motorized: 10 H.P. 220/440/3/60 motor.

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No. 3 Cinci. Dial Vertical Miller, Late
No. 2M Cinci. Vertical Miller, 1942
No. 4B B. & S. Plain Miller, Late, M. in base, Timken
No. 2 Standard K. & T. Pl. Miller, M. in base, Timken
No. 2LU Van Norman Univ. Miller, '42
5'14" col. American Trip. Purp. Radial, AC M.D.
5'12" col. American Trip. Purp. Radial, M. on arm
Barnes Combo. Boring & Honing Mach. up to 10" bore x 8" hole, 1942
48"x20'6" cen. Simmons Lathe, 1942
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36"x20' cen. Niles, 2 carr., 1 T.A. AC
32"x25' cen. Sommerfeld, 2 T.A., 2 carr., 1942
22"-24¾"x46" cen. Skoda Lathe, NEW
14"-16½"x54" cen. Bradford Lathe, T.A., 1943
14"-16½"x30" cen. L. & S. Lathe, T.A. '43
12"x36" cen. Pratt Whitney Model B La., '43, NEW
21" Cinci. Acme Univ. Brass Lathe, 1940
26" Libby "C" Turret 4½" capty
16" Gemco Univ. Shaper, '43, like new
No. 26 Morey Univ. Turret La., NEW

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G & L and Universal 3" Bar Horiz. Boring Mills
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Gleason 11" Bevel
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Sundstrand 00 Rigidmills

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Gorton No. 6½D Duplicator
Morey No. 12M Profiler 2 sp.
Pratt & Whitney #2 Jig Borer

PRESSES
Bliss #78½, 330 Ton
Bliss 3½A Double Action Toggle
Bliss No. 18, 20, OBI.
Bliss No. 304A, 4" Str. 23"x24" bed, S.S.
Bliss No. 650 Hi-Production, 88, 62, 162
Bliss No. 4½ Double Action Cam
Colton Tablet Presses.
Gen. Flexible Screw Press.
Stokes Tablet Presses, Model R & T, DD2.
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Acme No. 6 W Bar and Chuck, Acme Fox.
Brown & Sharpe 2F
Foster No. 2B.
Gisholt No. 4, Bar and Chuck. 2L, Saddle Type Cross Sliding Turret
Warner & Swasey #2A, #1A, #6

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Band Saw: Tannewitz No. 36M, Marvel No. 8
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Die Casting Machine DCMT
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Hannifin	50	20"	30"	22 x 30
Southwark, D. A. Clamping Plate	125	30"	2' to 4'	84 x 30
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Chambersburg	300	10"	27"	22 x 34
Southwark	350	42"	78"	28 x 48
Southwark	550	23"	68½"	42 x 32

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Waterbury Farrel	800	6½"	28"	22 x 24
Watson Stillman	300	12"	21"	24 x 20
Watson Stillman	300	12"	19"	20 x 20
HPM	180	15"	14½"	30 x 30
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Elmes—With Elec. Plates	50	6"	12"	18 x 18
Stewart Bolling	85	10"	19"	20 x 20

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NILES — 600 ton 96" 500 ton — 48"; 300 ton — 48.

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Mfr.	Size	Pounds
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American 20"x8' Bed G.H. Lathe
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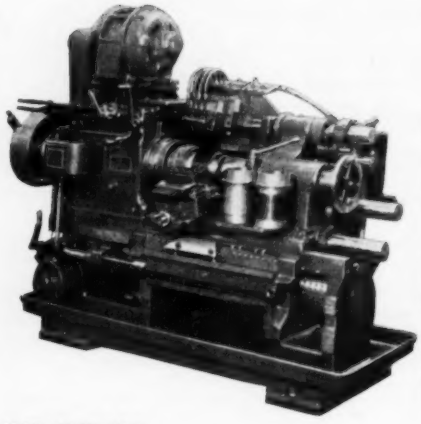

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6x30" Cincinnati Hydraulic, m.d.
6x32" Fitchburg Type A, m.d., late
7x11" Lunch External Grinder, p.f.
8x18" Cincinnati Saddle Type, m.d.
8x36" Cincinnati Saddle Type, m.d.
No. 10 Brown & Sharpe Self-Contained, m.d.
No. 11 Brown & Sharpe Self-Contained, m.d.
10x18" Landis Type C, m.d.
10x24" Landis, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x48" Brown & Sharpe, belt
10x72" Brown & Sharpe, belt
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis, m.d.
12x48" Cincinnati Plain Self-Contained, m.d.
12x48" Cincinnati, with spline grinding attachment
12x48" Modern, belted m.d.
12x96" Landis, m.d.
14x18" Cincinnati Plain Self-Contained, m.d.
14x36" Landis Type C, m.d., late type
14x48" Cincinnati Plain Self-Contained, m.d.
14x50" Norton, motorized
14x52" Norton, motorized
16x48" Landis Type D, m.d., latest
20x120" Landis Self-Contained, m.d.

UNIVERSAL CYLINDRICAL GRINDERS

6x29" Fitchburg Hydraulic Spline & Gear Grinder, m.d., latest
No. 2—12x36 Brown & Sharpe Self-Contained, m.d.
No. 2—12x36 Brown & Sharpe, belt
12x30" Landis Hydraulic, m.d., late type
12x36" Cincinnati Self-Contained, m.d.
12x48" Cincinnati, arranged for spline grinding
12x48" Cincinnati Hydraulic, m.d., latest type
12x48" Norton, m.d., latest
16x48" Cincinnati, belted m.d.
16x24" Cincinnati Self-Contained, m.d.
18x48" Cincinnati Hydraulic, m.d., latest

DISC GRINDERS

No. 151 Besly, m.d.
Hammond Disc Sander, Model No. 600
Model V10 Hammond Belt Sander, m.d.
No. 4 Gardner Disc Grinder, m.d.
No. 5 Gardner Disc Grinder, Double End, m.d.
No. 20 Gardner Comb. Disc Grinder & Roll Sander, m.d.
7½ H.P. Standard, m.d., new
7½ H.P. U.S. Elec. Tool Co. Disc Grinder, m.d., new

THREAD GRINDERS

No. 33 Excello Precision, m.d., latest
No. 39A Excello Internal, m.d., latest

INTERNAL GRINDERS

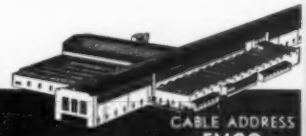
Wisco Precision Internal Grinder, m.d.
No. 10—10" Bryant, m.d., late
No. 15—22" Bryant, m.d., latest
No. 15RS Bryant, m.d., latest
No. 16—36" Bryant, m.d., latest
No. 9 Cincinnati, belt
No. 6, 10, 20 Bryant, belt
No. 24—21" Bryant, m.d., late
No. 49 Heald Single End Borematic, m.d.
No. 70 Heald, belt
No. 70A Heald, m.d., late type
No. 72A Heald Plain, m.d.
No. 72A Heald Gagematic, m.d.
No. 72A3 Heald Sizematic
No. 72A3 Heald Gagematic, m.d.
No. 72A3 Heald Universal Internal, m.d.
No. 72A5 Heald Sizematic, m.d.
No. 72A5 Heald Plain, m.d.
No. 72A5 Heald Plain, long bed type, m.d., latest
No. 72A5 Heald Universal Internal, m.d., latest
No. 73 Heald Airplane, m.d., brand new, latest
No. 74 Heald, m.d.
No. 104 Rivett, m.d., latest
No. 648-16 Van Norman Automatic Oscillating Radius, m.d., latest
Series 5—No. 5 Bryant, m.d., latest
Majestic Internal Grinder, m.d., swings 10" over table

SURFACE GRINDERS

No. 2 Brown & Sharpe, belt drive
No. 75 Van Norman Automatic Piston Turning & Grinding Machine, m.d.
Arter Model A-1—6" Rotary, m.d.
No. 10 Blanchard Rotary, m.d., 20" chuck
No. 22—12" Heald Rotary, m.d.
No. 23A—16" Heald Rotary, m.d., latest
No. 25A—24" Heald Rotary, m.d., latest
No. 3 Abrasive Vertical, m.d.
No. 33 Abrasive Vertical, m.d.
No. 78 Covell-Hanchett Hydraulic, m.d.
No. 268—18" Heald Rotary, belt
14" Pratt & Whitney Vertical, m.d.
16x28x48" Thompson, m.d., latest
22" Pratt & Whitney Vertical, m.d.
54" Bridgeport Knife, belt
84" Diamond H.D. Face Grinder, m.d
No. 7 Ultralap Lapper, m.d.

HONING MACHINES

H1 Micromatic Horizontal Hydrohoner, m.d.
H4 Micromatic Horizontal Hydrohoner, m.d.
No. 6 Barnes Twin Spindle Honing Machine, m.d.
Sunnen Hone, Model MA, m.d.



THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio — MElrose 1241

CABLE ADDRESS EMCO

UNUSUAL VALUES

Milling Machines—No. 1 Universal. No. 1 American (new) plain. No. 1 Vertical.

Drills—Large selection, single and multiple spindles also bench types, many of them new.

Gear Cutters—Brown & Sharpe No. 3—26" Gould & Eberhardt 42".

Grinders—Cylindrical B & S No. 11. Planer type 16"x36" Surface 13"x63", also new (small) Universal bench and floor type. All with coolant. Instantfeed.

Lathes—14"x8', 8', 10'—10"x6', 3', 10'—18"x8', 8' 10'—36"x16'—all cone drive, several motorized also (new) 18"x8' and 10' geared head, motorized. Large stock 19" and 18" bench and floor type.

Planers—Single head 24"x8', 24"x8', 28"x8'.

Shapers—16", 20", 24" B.G. crank.

Turret Lathes—J & L 3"x24"—3"x36" also Acme W & S Turret (vertical) boring and facing mills, 5 hole turrets, 30", 40".

SPECIAL—New totally enclosed dust proof, fan cooled ball bearing saw arbor motors, plain shafts to size or threaded, and with collars, measures only 3¼" from center of shaft to flatted top (1 h.p. to 15 h.p.) 2 or 3 phase, 3600 r.p.m.

WOOD WORKING MACHINERY—A very large stock of new and re-built, practically all motorized. New Motorized overhead cut-off and miter saw for wood, plastics, steel, aluminum and other metals. The above list is only a fraction of our stock which changes almost daily, therefore, tell us definitely what you want since we are adding considerable number of machines to our stock which are too many to list. What we have today may be sold tomorrow, so a list is really not dependable.

Drill—Foote-Burt No. 25 24" HI Duty 2" capacity in steel. Motor attached.

PATTERN MAKING MACHINERY—42"x16' bed wood lathe, compound rest, rack and pinion feed to carriage; 16" heavy duty joiner, extra long bed, front table tilts for giving draft to pattern work; tilting table also tilting arbor rip and cut-off saws; band saws; jointer; floor and bench type trimmers; and also many other machines for pattern work.

THE OSBORNE & SEXTON MACHINERY CO.
P. O. Box 88 — Columbus 16, Ohio

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

No. 49 New Britain Chucker, 1941.
20"x25" Fay Automatic, 1942.
9/16" A Cleveland, 1943.

BORING MACHINES

No. 49 Heald Single End, 1942.

DRILLS

No. 26 HO Baker Hyd, 1942.
No. 2 LMS Leland Gifford Hyd. 1942.

GEAR EQUIPMENT

No. 645A3 & 61A Fellows Gear Shaper. 1943.
No. 72 Fellows Gear Shaper. 1943.
No. 6 Gleason Revacycle. 1940.
No. 6 Gleason Testers. 1942.
8" Red Ring Internal Shaver. 1942.
Red Ring Universal Tester. 1942.

GRINDERS, CYLINDRICAL

16"x36" Cincinnati Plain H.D. 1942.
12"x30" Landis Universal. 1942.
10"x18" Norton Plain. 1942.
8"x18" No. 10 Brown & Sharpe Plain. 1943.

GRINDERS, SURFACE

30"x24"x192" Mattison Hyd. 1943.
14"x36" Pratt & Whitney Vert. 1943.
8"x24" Thompson Hyd. 1942.

GRINDERS, INTERNAL

No. 24-36 Bryant Hyd. 1943.
No. 172 Heald Hyd. Gap. 1940.
No. 72A3 & A5 Heald Hyd. 1943.
No. 73 Heald Airplane Cyl. 1942.

GRINDERS, THREAD

No. 33A Excello. 1943.
No. 39A Excello Int. 1942.
No. TG 615 Jones & Lamson. 1942.

LATHES, ENGINE

36"x396" American M.D.
16"x54" Reed Prentice. 1942.

LATHES, PRODUCTION

No. 3FV Voster "Fastermatic". 1942.
No. 3A Lodge & Shipley "Duomatic". 1943.
8"x108" Le-Swing Semi-Auto. 1942.
No. 4D Potter & Johnson. 1941.

LATHES, TURRET

8½"x24" Acme Univ. 1943.
No. 5.0 Acme Univ. 1942.
No. 1H-5 Libby Univ. 1942.
No. 6R Denver Univ. 1942.
No. 3 Bardons & Oliver. 1940.
No. 2 Warner & Swasey S.P.

MILLS, PRODUCTION

No. 34-36 Cincinnati Hydro. 1942.
No. 1-18 & 2-24 Cincinnati. 1942.
No. 1-14 Kent Owens Hyd. 1942.
No. 68 Plain & R & F Cinn. 1941.
No. 2 Sundstrand "Electromil". Late.

MILLS, THREAD

6"x36" LT Lees Bradner. 1942.

MILLS, UNIVERSAL

No. 3 Cincinnati D.T. 1945.

MISCELLANEOUS

2½" Elna Hyd. Cut-Off. 1944.
48"x½" Niles Plate Straightener.
No. 616 Cleveland Rigidturner. 1942.

PRESSES

300 Ton Lake Erie Hyd. 1945.
50 Ton Denison Straightening. 1942.

SHAPERS

24" Rockford H.D. Hyd. Latest.
6" Pratt & Whitney Vertical. 1942.

WELDERS

150 KVA Federal Seam. 1943.
100 KVA Taylor-Winfield Seam. 1943.
60 KVA Sciaky Spot. Like New.

Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*
1961 S. Meridian St. . . Indianapolis, Indiana

PRECISION BORERS

Two No. 2112 Excello single end, 2 spindle
One No. 112C Excello single end
Two No. 218 Excello heavy, double end
One No. 42 Heald heavy 2 spindle, work rotating type

HORIZONTAL BORING MILLS

3" bar Universal, No. 3A
3¼" bar Lucas, No. 32
4" Niles Bement Pond floor type
4½" bar Lucas, No. 33
5" bar Jones planer table type

VERTICAL BORING MILLS

24" Bullard vertical turret lathe
38"-44" Niles vertical turret lathe
52" King
84" Gisholt
100" Niles Bement Pond extra heavy

GEAR HOBBERS

No. 12 & type T Barber Colman
No. 8H, 12H, 16H5 & 18H Gould & Eberhardt
No. 130 Cleveland Rigidhobber
Nos. 1 & 5A Lees Bradner
No. 7125A Fellows gear shaper

GRINDERS, CYLINDRICAL

6"x18", 10"x18", 10"x36" & 14"x36" Landis hydraulic
10"x20", No. 1 Brown & Sharpe universal
6"x18" No. 10 & 6"x32", No. 11 B & S mechanical
10"x24" & 16"x72" Landis mechanical
10"x36" Norton hydraulic semi-automatic
10"x18", 10"x30" & 10"x50" Norton mechanical
12"x36" Cincinnati Filmatic universal

GRINDERS, SURFACE

Nos. 10, 16 & 16A2 Blanchard rotary
12" & 16", No. 22 Heald rotary
16" & 24", No. 25A Heald rotary
8" Pratt & Whitney rotary (tub)
8"x24", No. 34 Abrasive vertical
14"x36" Pratt & Whitney vertical
8"x24", No. 78 Wilmarth & Morman
8"x22", No. 3 Abrasive

GRINDERS, TOOL & CUTTER

K.O. Lee universal
Oliver template tool bit
Nos. 1 & 4T Sellers
Gisholt for lathe & planer tools
No. R6 Keller radius tool
No. 47 Excello carbide tool
18" Whitney wet tool
No. 13 Brown & Sharpe univ.
30" Ingersoll face mill

ENGINE LATHES

14"x6', 18"x6' & 20"x8' Lodge & Shipley
16"x5' & 16"x6' Sebastian
16"x10' American
18"x8' Rockford
25"x48" centers Leblond
26"x120" centers Wickes
30"x16' Leblond
36"x108" centers Bridgeford
40"x80" centers Leblond

MILLERS, KNEE TYPE

Nos. 2AS & 3B Milwuakee plain
No. 3 Van Norman duplex
No. 3 Oesterlein
No. 3 Cincinnati vertical
No. 3H Kearney & Tracker vertical
No. 3 Cincinnati HSDT vertical
No. 3 Kempsmith Maximiller vertical
No. 4 Cincinnati High Power vertical
Nos. 1-12 & 1-18 Cincinnati production

SHAPERS & PLANERS

16", 20", 24" & 28" G. & E. shapers
20" & 24" Gemco univ. shapers
24" Columbia univ. shaper
16" Bement Miles slotter
30"x24"x6' Liberty openside planer
36"x36"x8' Gray planer
48"x48"x12' Cleveland openside planer

MILES MACHINERY CO.
Box 770 SAGINAW, MICH.

LATHES

MONARCH 20"x72" centers Model "M", 16 Spd. Gr. Hd. 22½" swing, Monarch auto. sizing controls (late)

PRATT & WHITNEY Model "B" 16"x36" motor-in-base

PRATT & WHITNEY 16"x54" ctrs. Model "C" (late type)

MONARCH 24"x162" ctrs. M.D. Engine Lathe—actual swing 20"

NILES-BEMENT-POND 48" x 50' centers — quick change gr.—gr. hd. heavy duty AC motor drive—2 carriages—taper attachment—power rpd. traverse—10 spds. 2.04 to 90 RPM—late type

AMERICAN 18"x8' 12-Speed G.H., swing 20½"—centers 50½"

TURRET LATHES

2—FOSTER #5U Turret Lathes (late type) with chucks & tooling—hole thru spindle 3½"—hardened steel ways

2—WARNER & SWASEY #1, ⅝"x4", Electric Turret Lathes (late type) with 1/3 HP motor for power automatic chuck bar feed—4-speed spindle motor

GRINDERS

BROWN & SHARPE #4, 10"x60" Univ. Grinder, M.D. complete attachments.

BROWN & SHARPE #5, 3"x18" Plain Grinder, M.D. with sizing attachments—(1944 vintage)

BLANCHARD #10 High Power Rotary Surface with 18" chuck, capacity 18" dia. (excellent condition)—10 HP Spindle motor

TOOL AND CUTTER GRINDERS

NORTON #2 Universal Hydr. Tool & Cutter, 1945 machine, complete with M.D. Universal workhead and attachments

NORTON #1 Tool & Cutter Grinder (late type), with workhead and footstock,—attachments (1941 vintage)

DRILLS

CINCINNATI-BICKFORD 24" and 28" "Super-Service" Upright Drills (late type)—#4 Morse taper—with tapping attachments—1000 RPM—constant

AVEY 2-Spindle M.D. #2 Power Feed Drill #2 taper.

3—RUESCH Two-High Water Cooled Rolling Mills, 8" face, 5" dia. rolls, and one that is not water cooled—complete with one extra set of water cooled rolls and one extra set plain rolls—M.D.—complete with coiling devices—originally used for reducing nickel stock from .040 to .007 thickness—herringbone drive

PLANERS

CINCINNATI 30"x30"x8' Hypro Planer M.D.—one rail and one side head

NILES 11½"x24 foot capacity plate Planer M.D., pneumatic holddowns

Botwinik Brothers
of Mass. Inc.
3 SHERMAN ST WORCESTER 1, MASS

MODERN MACHINES

#35 Landis Horizontal Boring Mill, 3½"
24"x10' centers American Lathe
24" Potter & Johnson Shaper
#35 Excello Thread Grinder
612A Fellows Gear Shaper
28/120 Cincinnati Horizontal Hydrotel
36/90 Cincinnati Hydromatic Miller
16/28 Bryant Internal Grinder
Model H-3 Barnes Hydram Drill

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St. Providence, R. I.

LATE MODEL TOOLS

10"x20" MONARCH Model EE Toolroom Lathes
12"x30" MONARCH Model CK Lathes.
18"x30" LODGE & SHIPLEY Selective Geared Head Engine Lathe.
20"x48" AMERICAN "Pacemaker" Multi Production Lathe.
#43 LUCAS 4½" Bar Boring Mill.
4½"x36" P&W Model C Thread Miller
No. 2HS CINCINNATI Vertical High Speed Dial Type Miller.
Nos. 2K and 3H K&T Vertical Millers.
No. 2BL NATCO "Holesteel" Multiple Spindle Drill, rectangular head.
No. ½B P&W Two Spindle Reaming Machine.
No. 2 B&O Geared Electric Turret Lathe.
No. 3 W & S Ram Type Univ. Turret Lathes.
H-3 BARNES Hydram Drill.

INGERSOLL
Late Type
36" x 36" x 12'
PLANER MILLER
Adjustable rail, three heads, 40 HP AC Motor Drive. Excellent condition.
IMMEDIATE DELIVERY

Model W-7 BAUSH Hydraulic Multiple Spindle Drills.
20" G&E Industrial Shaper.
36" CINCINNATI H.D. Shaper, 1942
No. 3B B&S Dual Control Plain Miller.
No. 145 CLEVELAND Rigid Hobber.
#725A FELLOWS High Speed Shapers
No. 12 FELLOWS Gear Shaver.
Nos. 1LMS Leland-Gifford 6 Spindle Drills, 1942.

Wigglesworth Machinery Co.
283 BENT ST.
CAMBRIDGE 41
MASS.
KIRKLAND 7-5242
MACHINE TOOLS

CLEVELAND RIGIDHOBBER

#130 Univ. for Spur and Helical Gears Max. 8" Dia., 8" Travel. High Productive Mach. (Prac. New)

ROSENKRANZ, WEISBECKER COMPANY
149 Broadway New York 6, N. Y.

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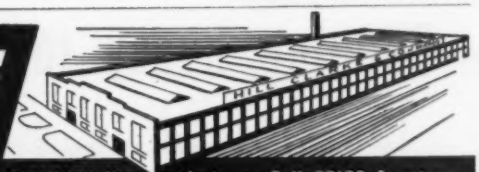

ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary

AUTOMATICS
No. 49 New Britain, 4 Spdl. Chucker

DRILLS
1, 2, 3, 4, 5, 8 Spdls Leland-Gifl., Allen, Edlund, Avey's
No. 4BL Natco 36 Spdl. (1943)
No. C225 H Natco—20 Spdls. (1946)
No. 112 Defiance

GEAR MACHINES
No. 61-A Fellows Gear Shaper (1942)
No. 615A Fellows Gear Shaper (1942)
No. 71-A Fellows Gear Shaper (1942)
No. 72 Fellows Gear Shaper
No. 12 Gleason Bevel Gear Generator
No. 13 Brown & Sharpe Spur & Bevel
No. 1 Whiton Auto. Gear Cutter

BORING MACHINES
No. 31 Lucas 3" bar, M.D.
Rockford—3½" Bar
No. 2 Lambert 4" bar
No. 46-B Heald Bore-Matic (1942)
No. DB-112 Excello—Single End—2 Hds.
24" Bullard New Era
42" Bullard New Era
42" King
60" Colburn, M.D.
72" Niles-Bement-Pond
84" Betts, M.D.

GRINDERS
3"x12" Brown & Sharpe No. 5 (1944)
4"x12" & 4"x18" Landis, Model H (1942)
6"x18" & 6"x30" Norton Type C Plain (1943)
10"-14"x36" Norton Type C Plain (1942)
10"x18" Norton Type C Plain (1943)
10"x48" Norton Type C Plain (1943)
10"x72" Landis Type C Hydraulic
Norton Motorized Grinders ranging from 6"x18" to 24"x144"
No. 104 Rivett Univ. Gdr. (1943)
No. 5 Bryant Internal Grinder
No. 34 Abrasive Surface Grinder (1943)
No. 22—12" Heald Surf. Gdr.
No. 25-A Heald Surface Grinder
No. 72-A-3 Heald Internal (1942)
No. 72-A-5 Heald Internal (1942)
No. 74 Heald Internal (1942)
No. 18—36 Bryant Internal Gdr.
No. 24-26 Bryant Internal Gdr.
No. 81 Heald Centerless Internal

LATHES
18"x8' American, Gdr. Head, M.D.
17"x8' LeBlond, Cone Hd., M.D.
18"x8' American Gd. Hd.
24"-27"x22' Lodge & Shipley
36"x18" Betts—Bridgeford Grd. Head
10"x22" Sundstrand, Model AA (1943)
20" Fay Automatics (1942)
Model R-14 Seneca Falls Lo-Swing
No. 4 Gisholt Univ. Turret Lathe (1942)
No. 4R Libby (1942)
18" Libby, M.D.
No. 4F Fastermatic (1942)

MILLING MACHINES
No. 3B Milwaukee Plain
No. 4 Cincinnati H.P. Plain
No. 0B Cincinnati Vert.
No. 2½-B Milwaukee Vert.
No. 2 Cincinnati Dial Type Vertical (1941)
No. 3 Cincinnati H.P. Vertical
No. 0-B Cincinnati Pl. Mfg. Type
No. 1-1B Cincinnati Mfg. (1942)
No. 2—18" Sundstrand-Electromill (1942)
No. 2—24" Sundstrand Electromill (1942)
No. 4-4B Cincinnati Hyd. Tracer (1942)
No. 45-4B Cin. Hyd. Tracer (1941)
6"x36" Lees-Bradner—Model LT (1943)
12"x54" H.T. Lees-Bradner Thread Miller (1943)
10"x48" Hanson-Whitney Thread (1942)
48"x24"x12' Ingersoll Slab Miller
36"x24"x12' Ingersoll Duplex Miller (1946)
No. 10 Ingersoll 72"x6' Travelling Col. Face Millers (1942)
No. 36—120 Cincinnati Horizontal Hydrotel

MISCELLANEOUS
36" Ohio Shaper
18" Dill Slotter
No. 8 Armstrong Band Saw
10"x10" Rassmussen Saw, Stock Fd.
4" Toledo Pipe Machine (1944)
Micromatic Vertical & Horizontal Hydrohoners

PLANERS
36"x36"x12' Cincinnati
36"x36"x12' Gray, 2 Hds.
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

SEND FOR COMPLETE LIST

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GUARANTEED TOOLS

5 L Gisholt Turret Lathe, New 1945, 12½" hole, quick change gear box, full length lead screw, bar feed, 28" three jaw chuck, 32" four jaw chuck, preselector head, 50 HP AC Motor.

Model R-14 Seneca Falls "Lo-Swing" Lathe, 16"x40", automatic timing. 1941.

28"x20' Bed Bertram "Time Saver" Lathe, 12' center, rapid traverse, 20 HP AC Motor, New 1942.

7D Jones & Lamson Flat Turret Lathe, preselector head. 1942, hard ways, air chuck.

4" Bar Foot-Burt Table Pipe Horiz. Boring Mill, vertical range 53½" horiz. range 84", AC Motor, New 1942.

No. 72 A3 Heald Internal Grinder, Cross Sliding Head, 1943.

Model 60 New Britain Automatic 1", 6 spindle, threading spindle, tapping spindle, bar feed.

No. ½ Buffalo Universal Iron Worker with built in coper & notcher, New 1937.

No. 2 Norton Universal Tool & Cutter Grinder, motor driven workhead, New 1943.

No. 7 Fellows Gear Shaper hi-speed, 1943.

No. 7 Gleason Rebex gear rougher, 1943.

O'CONNELL MACHINERY CO.

SCREW MACHINES

#1 Brown & Sharpe, Hand

#2 Brown & Sharpe, Hand (2)

#4 Warner & Swasey G.H. Universal, serial #338359

#4 Warner & Swasey G.H. Universal, serial #560237

#4 Warner & Swasey G.F.H. Universal Turret Lathes (4)

#6 Warner & Swasey G.F.H. Turret Lathe, serial #286187

#7U Foster G.H. Universal Turret Lathes, 1536 (2)

#1L Gisholt Turret Lathe

#2A Warner & Swasey G.H. Universal, serial #198504

#12 Gisholt Hydraulic Automatic Turret Lathes (2)

#00, #0 and #2 Brown & Sharpe Automatics

#00 Brown & Sharpe Turret Formers, roller bearing (3)

#0G Brown & Sharpe H.S. Automatics, 11,000 serial (3)

#2G Brown & Sharpe H.S. Automatic, serial #9015

#2G Wickman Swiss Type Automatic

⅜" Model DA2 Davenport Automatics (2)

⅝" Model C Acme Automatic

⅞" Model A Cleveland Automatic

1" Model C Acme Automatic

1½" Conomatic four spindle Automatic, serial #2514

1⅜" Model A Cleveland Automatic (1943)

1⅝" Foote-Burt Automatic (1941)

3¾" Model A Cleveland Automatic, serial #30484

#454 New Britain Automatic Chucker

8½"x8" Goss & deLeeuw Chucker

MACHINE TOOLS

TELEPHONE TAylor 9-8200
LAKE MACHINERY COMPANY
942 WEST LAKE STREET • CHICAGO 7, ILLINOIS

LEAF BRAKE

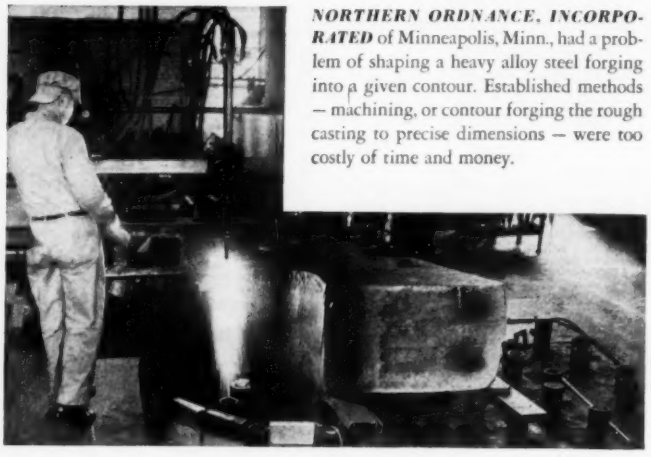
12'x¼" DREIS & KRUMP. AC MOTOR DRIVE.

WEST PENN MACHINERY COMPANY
1210 House Bldg. Pittsburgh, Pa.

Robbins & Myers Electric Hoists & Motors. All sizes in stock
Roll-forming machines and Roller Dies
Engineering service on your metal-rolling problems
Brakes, Shears, Rolls, Sheet metal Equipment
Welders, Grinky, 125, 150 KVA, complete

J & L MACHINERY & SUPPLY CO.
7906 Mack, Detroit, Mich. WA 5-0800

Shaping heavy forgings faster...at less cost with machine gas cutting



NORTHERN ORDNANCE, INCORPORATED of Minneapolis, Minn., had a problem of shaping a heavy alloy steel forging into a given contour. Established methods — machining, or contour forging the rough casting to precise dimensions — were too costly of time and money.

A. P. Demmer and R. F. Helmkamp, Airco Technical Sales Representatives, recommended oxyacetylene machine cutting the rough forging, using an Airco No. 6A Oxygraph.

Since the forging was about 70″ long and 28″ thick, weighing almost 7 tons, it was necessary to build special cutting support jigs — one for each cutting requirement. Further, to handle the many cutting positions, the Oxygraph had to be raised 4′ off the floor.

The operation was highly successful. The shape cutting technique proved extremely economical and fast, and the company was highly pleased with both the technical aid furnished and the results obtained.

• • • •

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LOW-COST AIRCO No. 10 RADIAGRAPH GAS-CUTTING MACHINE

The No. 10 Radiagraph is a motor-driven portable gas-cutting machine that cuts in straight lines of any desired length, at speeds from 4″ to 50″ per minute. It also cuts arcs up to 42½″ radius, circles from 3″ to 85″ in diameter, and bevels up to 40° angle. It weighs only 41 pounds net, and is easily moved from job to job.

VERSATILE AIRCO No. 4 RADIAGRAPH GAS-CUTTING MACHINE

The No. 4 Radiagraph performs all the cutting operations attributed to the No. 10, but its scope is increased by the addition of various attachments. For example, a Two-Torch Holder Attachment is available for simultaneous parallel cutting; as well as an I-Beam Splitting Attachment and a Side Roller Attachment which permits it to follow a templet or guide. Further, the No. 4 is especially serviceable for mounting flame-hardening torches as its use permits accurate control of degree of hardness and depth of penetration.

HEAVY-DUTY AIRCO No. 41 RADIAGRAPH GAS-CUTTING MACHINE

Similar in operation and design to both the No. 10 and No. 4, the Airco No. 41 is built for heavy-duty work. Weighing 180 lbs., and capable of traveling 1 to 72″ per minute, it is used for skull cutting, slab ripping and billet nicking. It is also used for multiple torch flame hardening where surface hardening is carried over extended areas . . . and it is ideal for carrying automatic and semi-automatic Airco Heliwelding or Aircomatic equipment.

A three-hose, water-cooled machine cutting torch, a plate-edge preparation device, and similar accessories are available for use with the No. 41.

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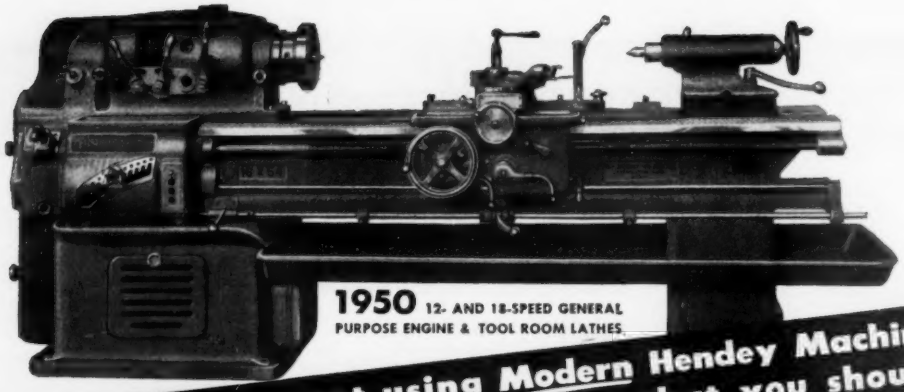

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. . . If you are not using Modern Hendey Machines you are not earning the profits that you should!

Hendey Engine and Tool Room Lathes have been, and always will be, tops for accuracy. But, are you aware of the many other modern features of the new Hendey line? Like all Hendey Lathes, the 12- and 18-speed now have induction hardened and precision ground bed ways for both carriage and tailstock. Every important unit has fully automatic lubrication. The rear end of the spindle is graduated for indexing when cutting multiple threads, and there are 36 thread and feed changes. The precision, all-geared headstock is powered from a built-in motor in the cabinet leg. Spindle speed ranges from 19-1000 R.P.M. A choice of cam lock or long taper key drive spindle noses. Modern Hendey Tool Room Lathes are available with swings of 9", 12", 14", 16", 18", 20" and 24". Write today for full details and complete specifications.

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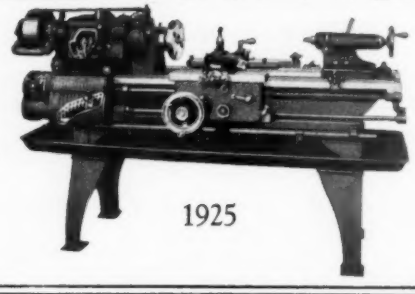

1925

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with *extra* shut height, *extra* throat depth, *extra* long stroke.

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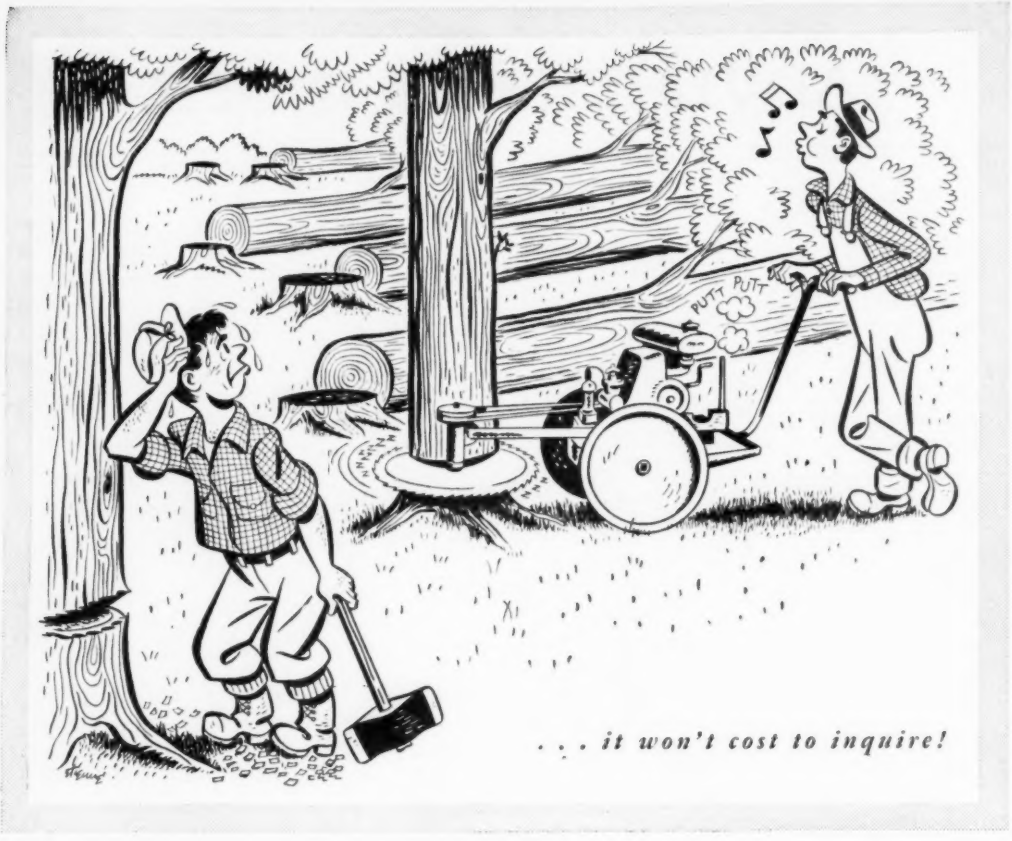

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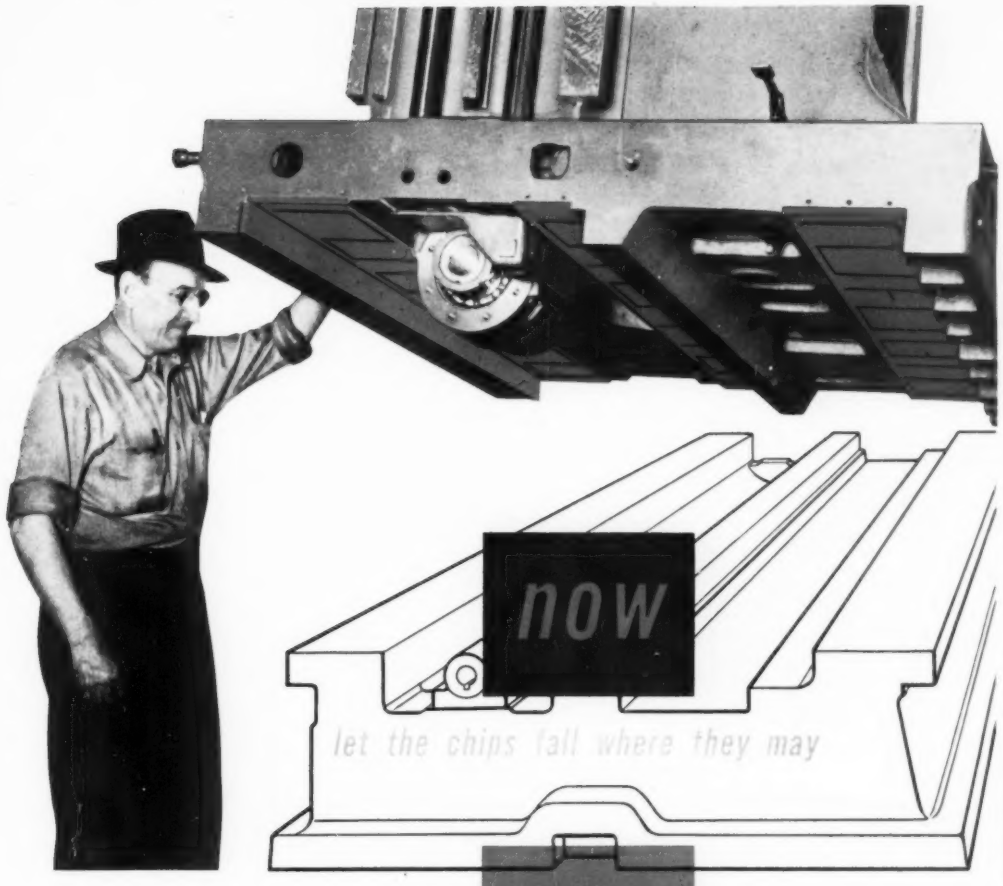

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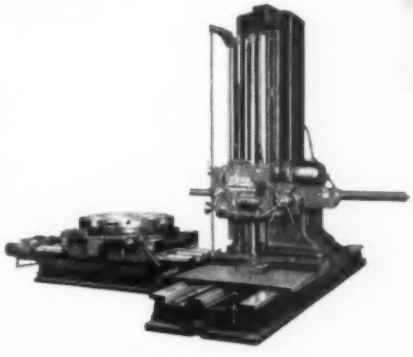
Now Cincinnati Gilbert brings you non-metallic way blocks to ride between the column base and the runway in floor-type Horizontal Boring Machines. Field tests indicate that with average lubrication and cleanliness this development *extends service life of the ways almost indefinitely.* Wear is negligible and accuracy is maintained. . . . The new way blocks are made from phenolic laminates, sliced edgewise to fiber grains. . . . This is just another of many reasons for specifying "Cincinnati Gilbert" on your next horizontal boring mill purchase. . . . The Cincinnati Gilbert Machine Tool Company, 3360 Beekman Street, Cincinnati 23, Ohio.



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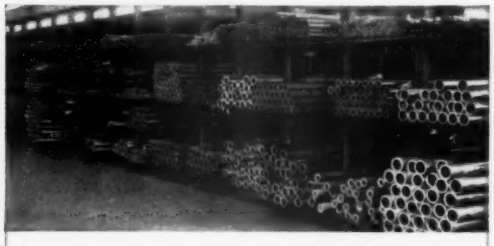
Ready for delivery now — from warehouse stock!

Two TIMKEN® wear-resistant steels that do 90% of your hollow parts jobs!

If you need steel tubing in a hurry for making hollow parts, let Timken® 52100 and "Nickel-moly" help you out. These two general purpose steels offer good hardenability and wear resistance. Between them, they can do nine out of ten of your hollow parts jobs. And they are available from Timken in warehouse quantities for immediate delivery.

Write for free stock list now. And remember, you're sure of uniformity in both these steels—from tube to tube and order to order—because of Timken's rigid quality controls. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



1. 52100 TUBING

A high carbon chrome steel. A direct quenching steel which gives through hardness in moderate sections. Can be heat treated to file hardness and tempered back to any desired point. Frequently may be used in place of more expensive steels. Typical uses include: aircraft parts, slitter knives, bearing races, collets, pump parts, bushings. Available in 101 sizes, ranging from 1″ to 10½″ O.D.

2. "NICKEL-MOLY" TUBING

A low carbon nickel-moly steel. A carburizing steel which gives high surface hardness with a tough core. Has exceptional stamina and shock absorbing qualities when heat treated. Used for: piston pins, bearings, sleeves, knitting machinery, farm equipment, pump parts, bushings, perforating guns. Available in 52 sizes, from 1.389″ to 10.223″ O.D.

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Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing